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ROUTE 16 CAPACITY AND SAFETY STUDY

Sherborn Holliston Milford

FINAL REPORT

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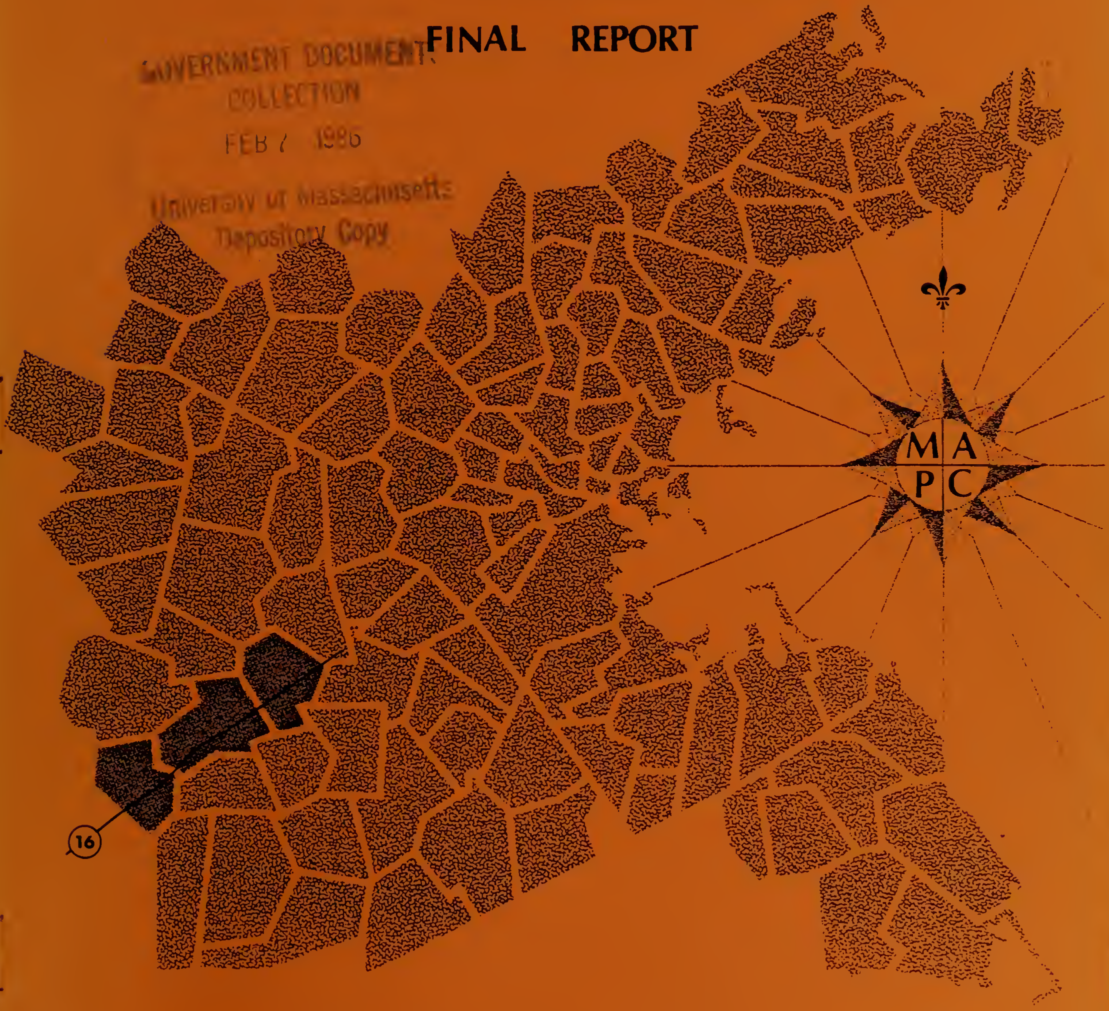

APRIL 1985

Metropolitan Area Planning Council
110 Tremont Street Boston, Massachusetts 02108

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I. STUDY BACKGROUND

This report was prepared by the Metropolitan Area Planning Council at the request of the towns of Sherborn, Holliston, and Milford; communities within the Route 16 corridor which are concerned about existing and potential future traffic on Route 16 as a result of development within or near the corridor in these towns expected to exceed six million square feet of floor area. The purpose of this report is to define the expected traffic volumes versus the vehicular capacity and related elements of the corridor from the intersection of State Routes 16 and 27 (Eliot and North Main Streets) in Sherborn west to the intersection of Routes 16 and 109 (East Main and Medway Streets) in Milford, a distance of 10.07 miles. Problem areas in terms of capacity and safety are identified (both existing and projected to year 1990), and mitigating measures are recommended for same.

This report has been funded by contracts 22946 and 23892 with the Massachusetts Department of Public Works (MDPW) and grant MA-09-0095 and MA-09-0107 from the Urban Mass Transportation Administration (UMTA), but the responsibility for the recommendations and opinions contained herein rests solely with the Metropolitan an Area Planning Council.

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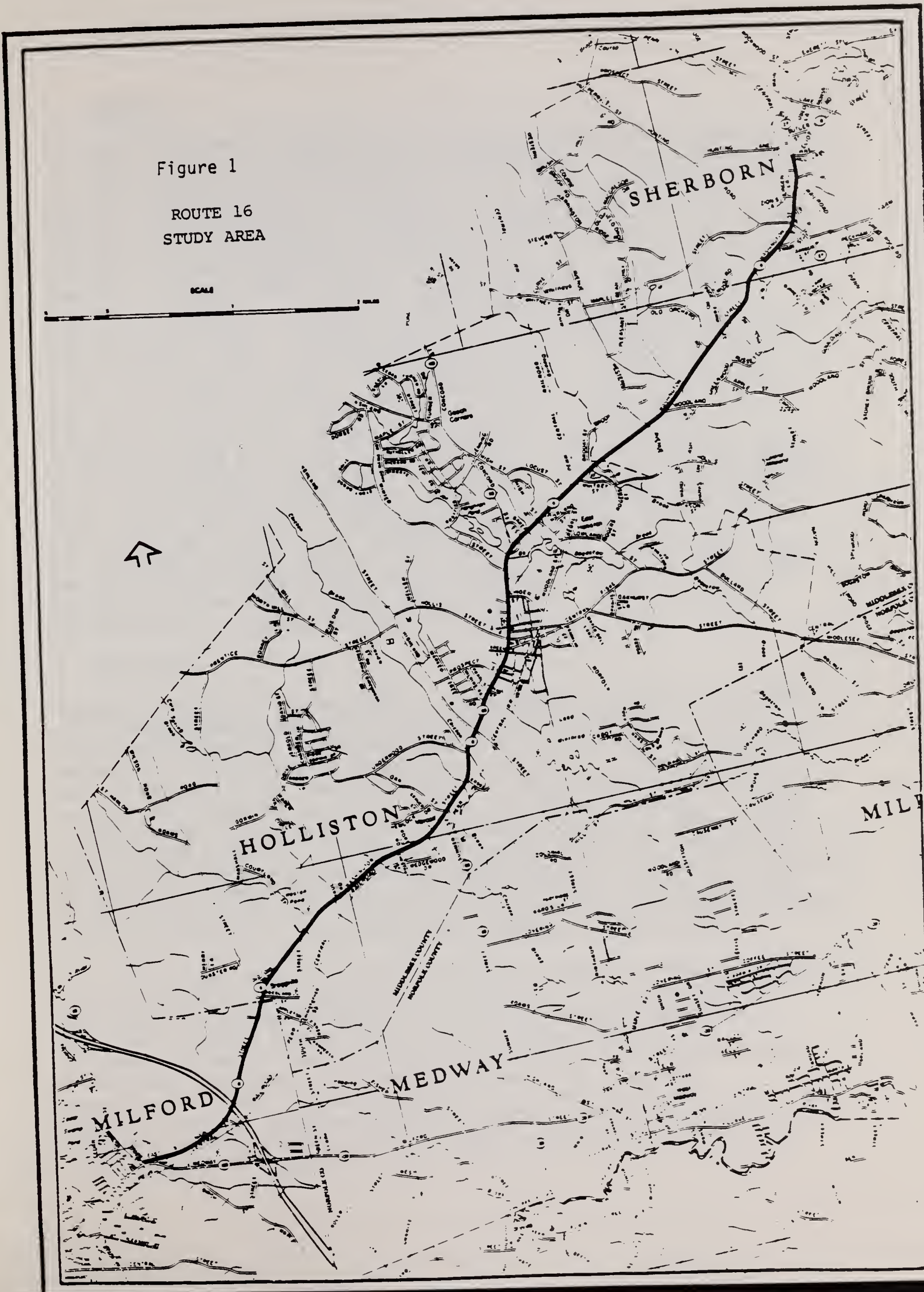
II. STUDY AREA DESCRIPTION

The contiguous towns of Sherborn, Holliston and Milford are located from 17 to 27 miles to the southwest of Boston. A map of the three-community study area is provided on the following page. Sherborn and Holliston are within Middlesex County and are within the jurisdiction of District 4 of the MDPW; and Milford is part of Worcester county and is within the jurisdiction of District 3 of the MDPW. Historically, the settlement of the study area dates from 1664, at which time the first water-powered mill in New England was developed on the Mill River in what is now Milford. Route 16, one of the oldest roads in the study area, was originally constructed in the early 18th century as a coach route between New York and Boston, via Hartford; and named in part for General George Washington who once travelled Route 16, stopping in Holliston at what was then the Littlefield Tavern on the north side of Route 16 just east of Hopping Brook. Prior to the 19th century, the towns in the study area were sparsely populated farming communities, with isolated saw or corn mills located on the various tributaries of the Charles River. During the 19th century, woolen and cotton mills were built in Holliston, and subsequently Holliston became a center for the manufacture of cloth, as well as other products including nails and combs. Milford's industrial base at the time was the manufacture of shoes, an industry which continues in Milford to the present day. The construction during the 1840's of the rail line between Worcester and Boston gave impetus to the quarrying industry which had begun in Milford in the 1820's. Most of the bridges, culverts and stations built on the line were of grey granite from various Milford quarries. In fact, the quarrying activities on the site currently being developed as Granite Industrial Park began specifically to fill the needs of the railroad's construction. The discovery during the 1880's of pink granite in Milford gave life to a new Milford industry. Milford pink granite became one of the most popular building materials of the day, and was used in the construction of such landmark American buildings as New York's Pennsylvania Station and Public Library, Pittsburgh's Allegheny Courthouse, Chicago's Marshall Field Warehouse, the Boston Public Library, and Quincy's Crane Memorial Library. The markets for both pink and grey granite waned during the early years of the 20th century, and granite cutting in Milford ceased in the 1930's.

During the better part of the 20th century the study area towns have experienced moderate growth as residential communities, with limited industrial growth in both Milford and Holliston. Access to I-495, constructed in the late 1960's, did much to foster economic growth in the study area, and as a result Milford has become a regional retail shopping area. From 1970 to 1980 the study area communities have had an average of 68 percent growth in employment. This growth occurred mainly in Holliston and Milford, and particularly in the manufacturing and service industries. Between 1980 and 2010, according to MAPC projections, the study area will experience a 21 percent growth in employment. The expected significant economic growth will have a major effect on the growth of traffic and on the quality of life in the area. This raises serious issues which need to be considered.

Figure 1

ROUTE 16
STUDY AREA



A. Sherborn

The town of Sherborn is predominantly rural and residential in nature. It is sparsely settled with 254 person per square mile. Of its 10,172 acres of land, 16 percent are in residential use, 13 percent are in agricultural use, and 69 percent are open, forested, or wetland. Very little of Sherborn's land is devoted to industrial or commercial uses, and between the years of 1970 and 1980 the largest change in the use of land was a 9 percent increase in acreage devoted to residential use. The population of Sherborn is 4,4049 (1980 figure), representing a 225 percent growth in population since 1950. By the year 2000 Sherborn's population is projected by MAPC to be 6,200, representing a 53 percent growth over the 1980 population level. There are 55.01 miles of public roads in Sherborn, all of which are within the Town's administration, and 10.86 miles of which are eligible for federal aid. The principal traffic routes are Routes 16, 27, and 115. Route 16 passes through Sherborn in northeast southwest direction, and Routes 27 and 115 pass in a north-south direction. Route 27 is a major circumferential corridor between Kingston on the south shore and Chelmsford in the north. Route 115 extends between Route 1 in Foxborough in the south and Route 27 in Sherborn in the north. There are no recent traffic volume counts on Route 16 in Sherborn (the most recent having been taken by MDPW in 1972, at which time Route 16 carried 7,600 vehicles daily in the vicinity of the Holliston town line). Route 27 carries between 5,910 (at the Natick town line) and 9,250 (near the Medfield town line) vehicles daily, and Route 115 carries 5,500 vehicles daily, according to recent MDPW counts.

B. Holliston

The town of Holliston, like Sherborn, is primarily residential in nature, but is more densely settled at 663 persons per square mile. Over 21 percent of the town's 12,176 acres are in residential use, with about six percent of total acreage in agricultural use and less than one percent each in industrial and commercial uses. As is the case in Sherborn, 69 percent of the land in Holliston is open, forested, or wetland; and the largest change in land use in Holliston between the years 1970 and 1980 was 9 percent increase in residential acreage. Holliston's population is 12,622 (198 figure), which represents approximately a 200 percent growth in population since 1950. Unlike Sherborn, Holliston's population is growing slowly, with only a five percent growth between 1970 and 1980, and a projected growth of 14 percent between 1980 and the year 2000.

Holliston's road network entails 75.85 miles of public roadway's, about 71 miles of which are administered by the Town. Just under 28 percent of Holliston's roads are on federal aid system. The principal roads in Holliston are State Routes 16 and 126, the former passing in a northeast-southwest direction, and the latter passing in a north-south direction between Woonsocket, Road Island and Route 2 Concord, Massachusetts. Route 16 carries between 7,800 and 12,350 vehicles daily, depending upon the location of the count (1981 and 1982 MDPW counts), and Route 126 carries between 6,250 and 12,491 vehicles daily in Holliston (1979 and 1983 MDPW counts).

C. Milford

The town of Milford, like Sherborn and Holliston, is primarily residential in nature, but is the most densely settled of the three with 1,526 person per square mile. Over 23 percent of the town's 9,808 acres are in residential use, and about 65 percent of the town is open, forested, or wetland. About two percent each of the total acreage in Milford is devoted to industrial and commercial uses, and less than one percent of the land is in agricultural use. As is true of Sherborn and Holliston, the largest change in land use in Milford between 1970 and 1980 was an increase in acreage devoted to residential use (about a four percent increase). The population of Milford is 23,390 (1980 figure), representing a 51 percent growth in population since 1950. Milford's population is projected by MAPC to continue to grow moderately between 1980 and the year 2000 by about 13 percent.

There are 104.19 miles of public roads in Milford, about 90 percent of which are within the Town's administration. About 38 percent of the road mileage in Milford is on the federal aid system. The principal traffic routes in Milford are I-495, and State Routes 16, 109, 85, and 140. Routes 16 and 109 pass in an east-west direction, and Routes I-495, 85, and 140 pass in a north-south direction through Milford. Route 109 extends from Route 16 in Milford to Route 1 at the Boston-Dedham line; Route 85 extends fro Route 16 in Milford in a northerly direction to Route 117 in Bolton; and Route 140 extends from New Bedford in the south to Route 12 in Winchendon near the New Hampshire state line.

Route 16 in Milford carries between 8,150 and 20,500 vehicles per day (1979 MDPW counts); Route I-495 in Milford carries 34,200 vehicles daily (1983 MDPW count); Route 109 carries 10,500 vehicles daily (1982 MDPW count); Route 85 carries 4,150 vehicles daily (1982 MDPW count); and Route 140 carries 5,100 vehicles daily in Milford (1980 MDPW count).

D. Study Area Traffic Growth

Traffic volumes within and dear the study area are growing at a moderate rate, which is representative of the growth in traffic throughout the Commonwealth. Traffic counts taken by MDPW at permanent counting stations within or near the study area (at points in Holliston, Hopkinton, Natick, Framingham, and Medfield) between the years 1975 and 1983 exhibit an average annual growth rate of 2.2 percent. This growth is not dissimilar from the two percent uniform traffic growth rate experienced throughout the Commonwealth during this period, based on the annual growth in the numbers of motor vehicle registrations and drivers' licenses. A two percent annual growth rate has been used in this study to project traffic volumes on Route 16 through 1990.

In addition to an average annual growth of two percent in study area traffic, known development projects will be responsible for contributing additional traffic to the road system of the study area in general and the Route 16 corridor in particular. Development projects now under construction of particular concern to the study area communities, and therefore to this report, are Granite Industrial Park on Route 16 in Milford and Hopping Brook Industrial Park on Route 16 in Holliston. Granite Industrial Park, when completed in 1994, will consist of approximately 2,000,000 square feet of industrial and office space on a 322-acre site formerly occupied by granite quarrying activities. Hopping Brook Industrial Park, when completed in 1987, will consist of 3,000,000 square feet of office, research and development, and assembly space on a 281-acre site which was formerly undeveloped. Other current and proposed projects of concern are the recent and ongoing Ledgemere Country development of the Fafard Companies just over the Holliston line in Ashland, which is partially complete and will entail, when complete, 600 multi-family residential units, 60 single-family residences, and 270,000 square feet of office and industrial space on 190 acres. Workmen's Circle is a residential development, also of the Fafard Companies, proposed for land in Ashland at Cedar and Pond Streets at Route 126 just north of the Holliston-Ashland town line, to include 640 condominium units and 44 single-family homes on 193.5 acres. Other projects of concern are the recently completed 287,000 square foot Data General Corporation facility in Milford to the south of Route 109, a 180-room hotel and restaurant complex of the Milford Northeast Development Corporation nearing completion on Beaver Street in Milford between routes 16 and 109 near I-495, and the Quarry Square shopping center proposed for a 19.6 acre site on Route 16 in Milford by the Fafard Companies. Quarry Square will provide an estimated 123,525 square feet of commercial space (department store, supermarket, bank, restaurant, and small retail shops), with 887 parking spaces, when completed in mid-1986.

III. EXISTING CONDITIONS

A. Characteristics of Route 16

State Route 16 is a major radial traffic corridor which extends in a northeast-southwest direction from Revere in the east to the town of Dudley at the Connecticut state line, a distance of sixty miles. Route 16 passes through 18 Massachusetts communities, 13 of which are within the MAPC region. Within the MAPC member communities of Sherborn, Holliston, and Milford, Route 16 is two-lane, bi-directional, and classified as a rural minor arterial on the federal aid primary system. It is without access control and has generally fair to good pavement conditions (of bituminous concrete, or sheet or rock asphalt) throughout its 11.16 mile length. Surface widths of Route 16 vary from 24 to 56 feet within the study area.

In Sherborn, Route 16 (known as Eliot, North Main, and Washington Streets) is from 24 to 26 feet in surface width, with two foot shoulders over a total distance of 4.21 miles. It passes over gently undulating terrain and its structural condition is rated as fair by the MDPW's Road Inventory File. The entire length of Route 16 in Sherborn is within the Town's administration, is posted for speeds of from 30 to 45 miles per hour, and provides access to the residential, institutional, and limited commercial land along its length. Route 16 in Sherborn is divided by a single unbroken yellow line for most of its length, with the exception of the portion between Old Orchard Road and Woodland Street within which any once-visible center line has completely worn away. This is of concern because this particular portion of Route 16 is posted for a 45 mile per hour speed limit and has the poorest road surface condition of any segment of Route 16 in the study area, with a very cracked and broken surface which has been the recipient of much patching in recent years. Route 16 in Sherborn is without overhead illumination or sidewalks, except for the portion within Sherborn Center from the intersection of Eliot and North Main Streets to the intersection of Washington and South Main Streets, and the intersections of Washington and Maple Streets and Washington Street and Western Avenue. Sight distances along Route 16 in Sherborn are generally good, with the exceptions of the intersection of Washington Street and Maple Street (which is on a rise which curves sharply just east of the intersection) and an elongated S-curve on a steep incline between the roadway's intersections with Russett Hill Road and Sawin Street. No on-street parking is allowed on Route 16, and within Sherborn Center approximately 55 off-street parking spaces are available in private lots associated with the various commercial properities there. Limited public transit service is provide on Route 16 by private carriers but no scheduled stops are provided in Sherborn.

For a distance of just over .4 miles Route 16 shares its right-of-way with State Route 27 through the Sherborn Center commercial area, resulting in congestion during the AM and PM peak travel hours, and safety problems throughout the day among the merging and diverging through-vehicles and local-oriented vehicles seeking access to the various commercial, residential, recreational, and other parcels within the center. This situation is compounded by the rail right-of-way which crosses Route 16 at grade in the center and which infrequently carriers freight trains. The most recent traffic volume counts on Route 16/27 in Sherborn Center are from 1972, at which time Route 16/27 carried an average of 7,600 vehicles daily. Traffic volume counts taken in the autumn of 1984 for the purposes of this study show that in excess of 1,950 vehicles pass through Sherborn Center on Route 16/27 during the AM peak hour, and in excess of 2,050 vehicles pass through Sherborn Center on 16/27 during the PM peak hour.

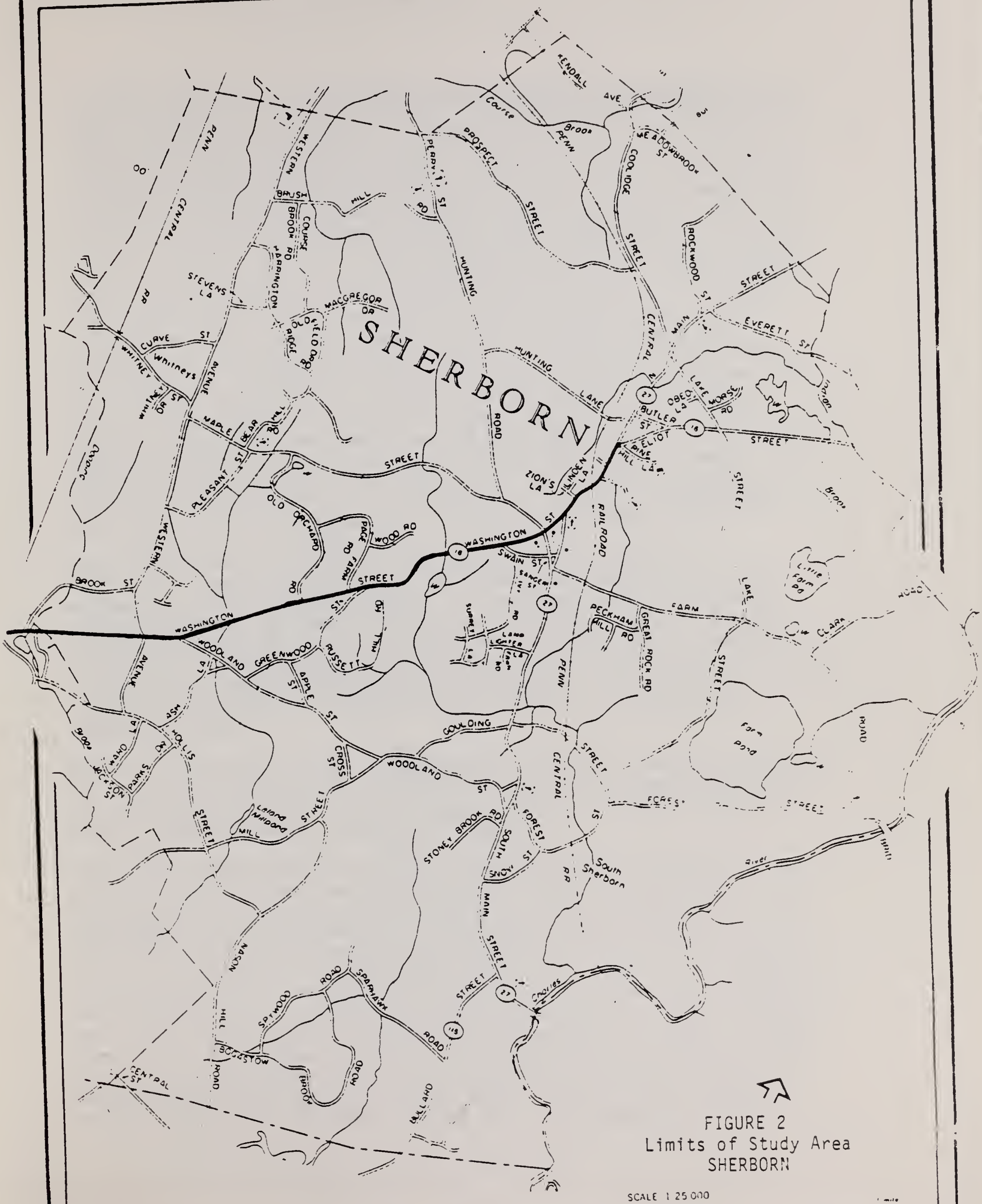


FIGURE 2
Limits of Study Area
SHERBORN

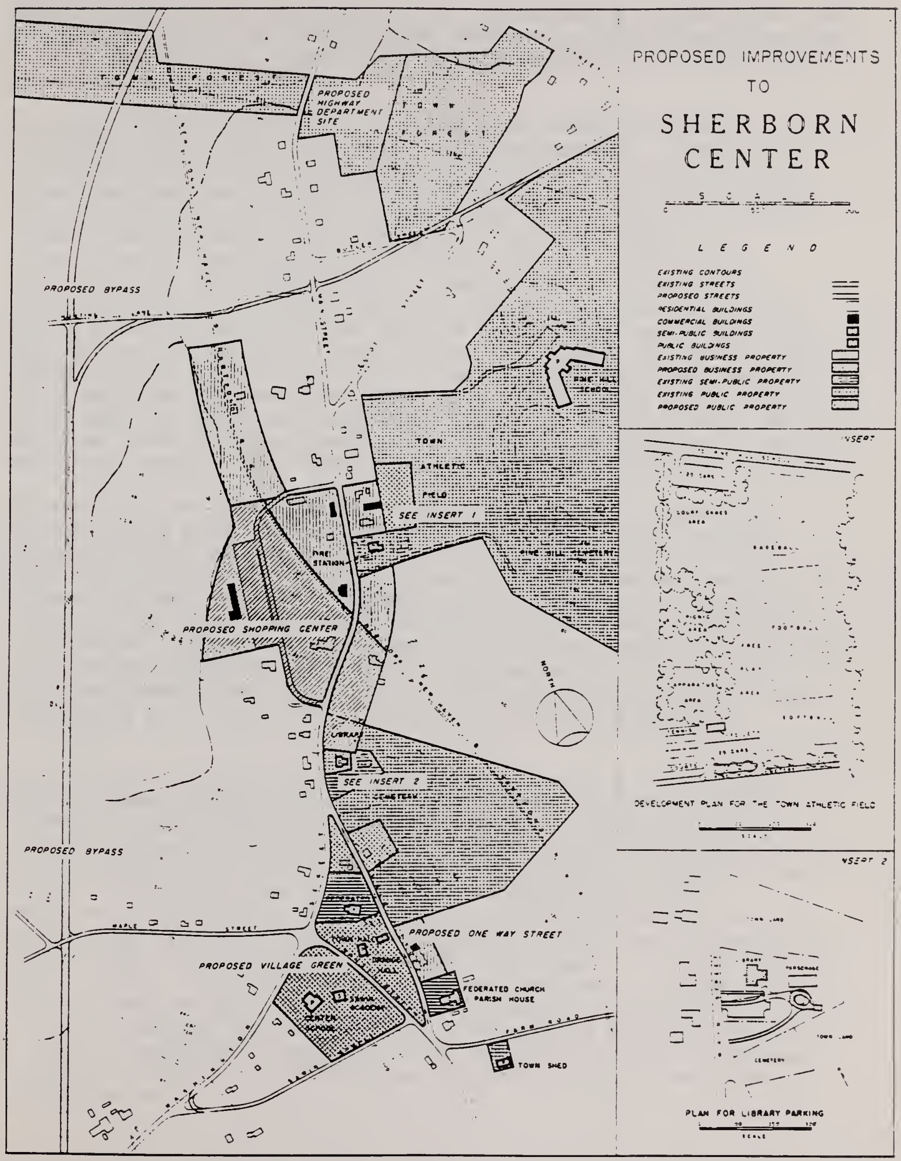
As first offered by the 1958 Master Plan (for the) Town of Sherborn by Shurcliff & Merrill, a bypass of Routes 16 and 27 around Sherborn Center has on occasion been proposed as a solution to congestion and safety problems on 16/27 in Sherborn Center. The 1958 proposed right-of-way for the bypass extended from the intersection of South Main Street (Route 27) and Goulding Street to the south of Sherborn Center in a northwest direction to Washington Street (Route 16), from which point it continued northwest to parallel Washington and North Main Streets about 750 feet to the west of both, intersecting Maple Street and Hunting Lane. At Hunting Lane the bypass would split; Route 16 proceeding easterly on realigned Hunting Lane and Butler Street to the existing alignment of Eliot Street. From the split at Hunting Lane Route 27 would proceed north to rejoin existing North Main Street in the vicinity of its Coolidge Street intersection. The proposed bypass, at a total distance of approximately 1.75 miles, was a drastic and expensive measure when first proposed, and can no longer be considered a feasible course of action to pursue in seeking to ameliorate congestion in Sherborn Center. Much of the right-of-way proposed for the bypass has been developed and is no longer available (particularly between South Main and Washington streets), and the expense of the endeavor in land-takings, environmental studies, design, and construction would be prohibitive in light of diminishing funding available for roadway construction in the Commonwealth.

Land along Route 16 in Sherborn is predominantly residential, agricultural, and open or forested in nature, with isolated areas of wetland and parcels devoted to small business enterprises. The only substantial change in land use along the Route 16 corridor in Sherborn between 1970 and 1980 was the development of about 15 acres of pasture land on Eliot Street between North Main Street and Butler Street for very low density residential use, and the development of land at the intersection of South Main and North Main streets for high density residential use.

Route 16 in Holliston (known as Washington Street) is from 26 to 28 feet in surface width, except in Holliston Center, with two-foot shoulders on all but one mile of its 5.44 mile length. Within Holliston Center the width of Route 16 varies from 28 to 56 feet.

The road is administered by the Town of Holliston for a distance of 2.28 miles from the Sherborn townline to a point near the intersection with Prospect Street in Holliston, and from that point is administered by the Commonwealth of Massachusetts for a distance of 3.16 miles to the Milford town line. Route 16 is posted for from 30 to 45 miles per hour and is without access control for its entire length. The roadway is divided by a solid double line for most of its length, with infrequent breaks where passing is allowed in either or both directions. The dividing stripes are well maintained on Route 16 throughout the town, and the general surface condition of the roadway is fair to good; particularly on those segments administered by the Town of Holliston. Maintenance of Route 16 on the portion which is administered by the MDPW is not up to the standard evident elsewhere on the road. To the west of Pope Road on Route 16

FIGURE 3
PROPOSED BYPASS OF SHERBORN CENTER (1958)[1]



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[1] Source: Master Plan (for the) Town of Sherborn, Shurcliff & Merrill, 1958.

westbound (WB) a catch basin has sunk to a level several inches below that of the road surface, and the Holliston Department of Public Works has, for at least the last year, maintained a reflective barrel in the sunken basin as warning to passing motorists.

The entire length of Route 16 is provided with roadside overhead illumination of current design which is well-maintained. Sidewalks are provided on both sides of Route 16 from Concord Street (Route 126) to Marked Tree Road; and on one side of the road between Concord Street and Locust Street to the east of Holliston Center, and from Marked Tree Road to Summer Street (Route 126) to the west of Holliston Center. All sidewalks are in good condition. ON-street parking is provided in Holliston Center from Linden Street to Central Street. The width of Washington Street in this area (36 to 56 feet wide) allows for parallel parking on both sides during the week and angle parking on Sunday only. About 60 on-street parallel spaces are provided, and 25 additional angle spaces are available in front of Saint Mary's Church at Linden Street. Trucks and buses are restricted from the parallel parking spaces adjacent to the major intersection of Washington Street and Hollis Street. An additional seven on-street parallel parking spaces are provided on Central Street just south of its intersection with Washington Street.

The undulating and winding nature of Route 16 through Holliston has created certain sight distance and safety problems at three specific locations, as follows. Washington Street's intersection with Locust Street is located at the crest of a rise in the road causing serious sight distance problems for vehicle operators both on Washington Street and exiting Locust Street. Washington Street's intersection with Cross Street is located on a wide curve at the base of an incline leading to Route 16's third serious sight distance problem, the intersection of Washington Street and Summer Street (Route 126). This third intersection is located at the crest of a long incline from each of the three approaching directions.

Limited private transit service is provided on Route 16 in Holliston. Route 16 shares its right-of-way with State Route 126 for a distance of 2.2 miles through Holliston's commercial center. That portion of Washington Street (Route 16/126) carries an average of 12,350 vehicles per day (1981 MDPW count) versus, for example, an average of 7,800 vehicles per day on Route 16 at the Milford town line (1982 MDPW count). Conditions on route 16/126 are, as a result of high volumes and merging and diverging traffic, congested and hazardous, particularly during AM and PM peak hours. Traffic counts taken for the purposes of this study show that on 16/126 in Holliston Center 1,487 vehicles pass in the AM peak hour and 1,688 vehicles pass in the PM peak. A bypass around Holliston Center of Routes 16 and 126 has been proposed on occasion as a potential solution to traffic congestion in that area. The feasibility of such an endeavor in Holliston is very questionable due to prohibitive costs and uncertain funding sources.

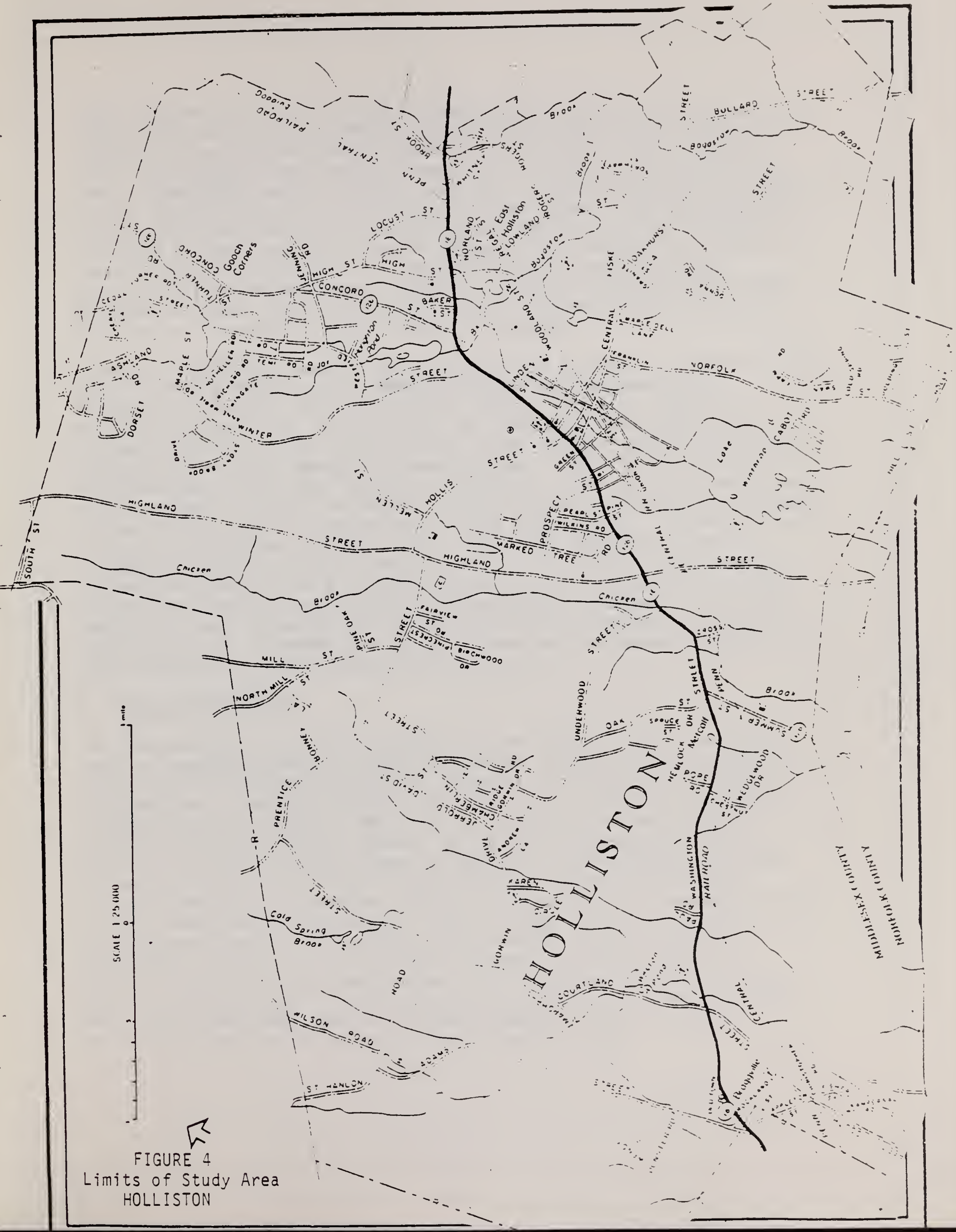


FIGURE 4
Limits of Study Area
HOLLISTON

Land along Route 16 in Holliston is predominantly residential or open in nature with concentrated commercial pockets within Holliston Center in the vicinity of the intersections of Route 16 with Central Street, Concord Street (Route 126), and Chestnut Street and Pope Road. Light industrial uses of land along Route 16 can be found near its intersections with Cross Street, Woodland Street, and at other isolated spots. Substantial changes in land use along Route 16 in Holliston have been few during the period from 1970 to 1980, and have involved primarily the reuse of open land in three to eight acre parcels for commercial, light industrial, or residential (apartments) uses. Sizeable parcels of open and wooded land on Route 16 in Holliston (particularly near I-495 and the Milford town line) are on the market and are zoned for industry.

Route 16 in Milford (known as Main and East Main streets) is from 30 to 46 feet in surface width, and is administered by the Commonwealth of Massachusetts for most of its 3.86 mile length, with the exception of a 0.7 mile portion within Milford. For the purposes of this study the portion of Route 16 under consideration is the segment extending from the intersection of State Route 109 (Medway Street) 1.55 miles east to the Holliston town line. That portion of Route 16 is from 32 to 44 feet wide with four foot shoulders, is posted for from 30 to 45 miles per hour, and carries 5,900 to 7,600 vehicles daily (1983 MDPW count). The road surface of Route 16 in Milford is fair to good within the study area, and is divided by a double yellow stripe for most of its length. No sidewalks are provided, except for a .12 mile segment along the south side of Route 16 from its intersection with Route 109 easterly. Overhead illumination, though provided, is uneven in that many of the fixtures are very old or inoperative. No on-street parking is allowed on this segment of Route 16, and no particular sight distance problems exist.

B. Major Intersections

The characteristics of Route 16's major intersections within the study area are documented here to establish a basis for evaluating the capacity and safety of the roadway corridor. Route 16 in the study area has 53 intersections. Many of these intersections are of little consequence to the operation and safety of Route 16 due to the low volumes of traffic carried by the intersecting streets, or to the intersecting streets' nature as private or semi-private residential or other dead-end streets. On the other hand, there are a large number of intersecting streets (excluding major state numbered and other routes which are addressed later in this report) which, due either to the volumes of traffic they carry or to the geometrics of intersections with Route 16, affect Route 16's operations and safety to a considerable degree. Those intersecting streets are highlighted below, by town, with brief descriptions of their effect on Route 16. All listed intersecting streets are administered by their respective Towns, and all intersect Route 16 at unsignalized locations signed for full stops, unless otherwise noted.

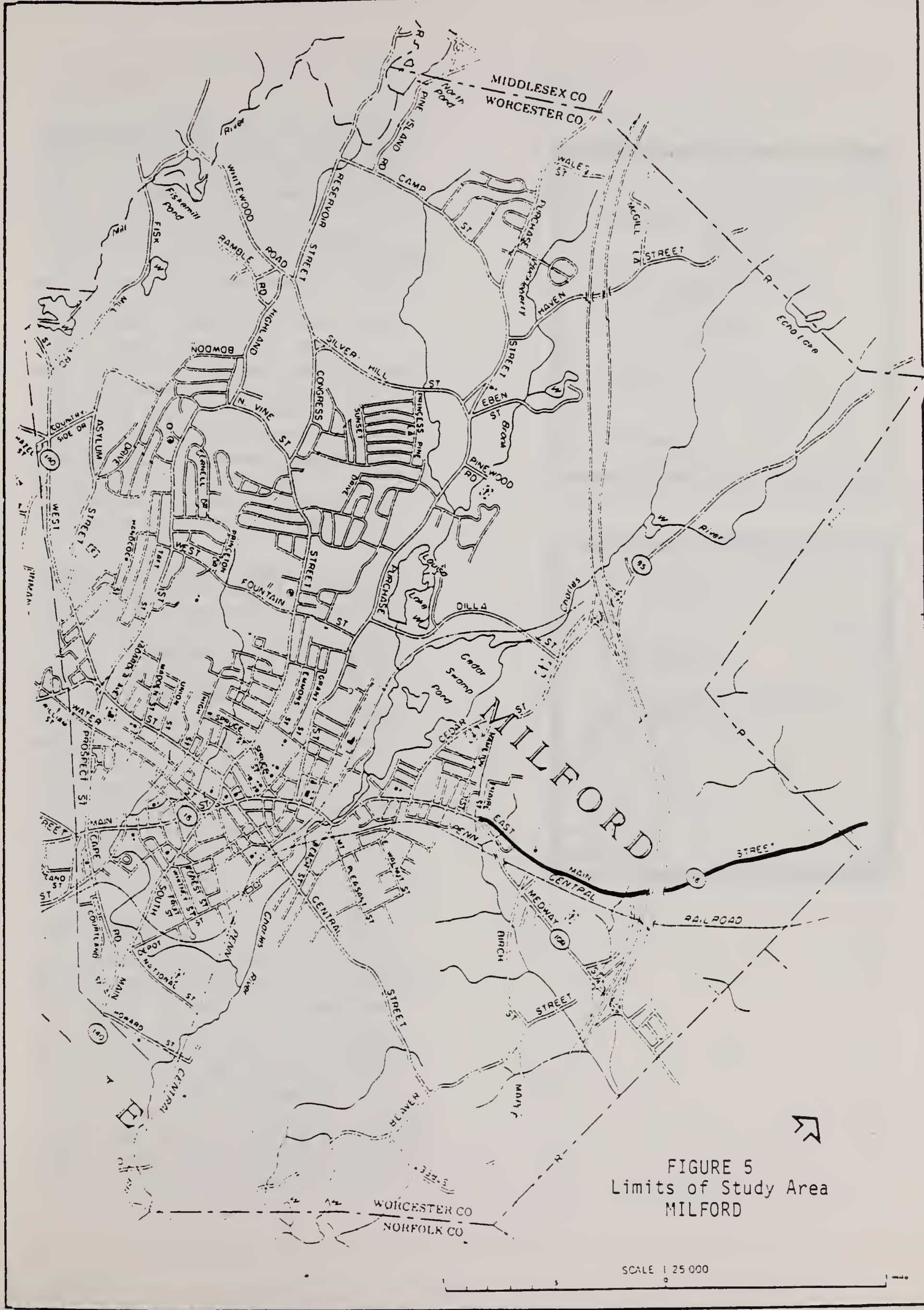
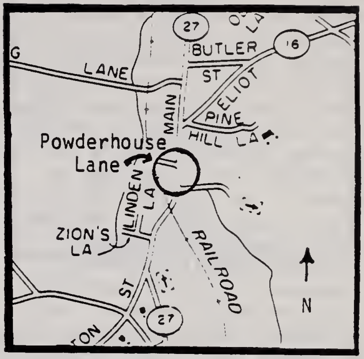


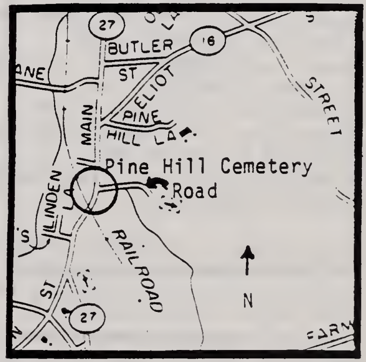
FIGURE 5
Limits of Study Area
MILFORD

1. Sherborn

Powderhouse Lane is a 15 foot wide, street which intersects North Main Street in a perpendicular fashion about 450 feet to the west of North Main Street's signalized intersection with Eliot Street. Although Powderhouse Lane is a dead-end street just over one-half mile in length, it experiences significant traffic volumes due to the adjacent commercial area's parking lot which uses Powderhouse Lane as one-way egress to North Main Street in both directions. As a result, particularly during peak traffic hours, queues develop on Powderhouse Lane and within the parking area of vehicles seeking to turn onto North Main Street.



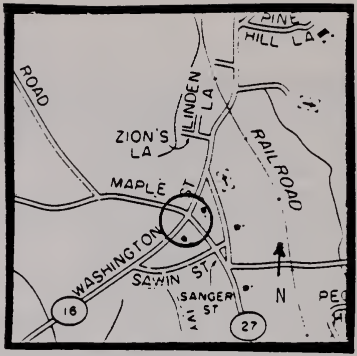
Pine Hill Cemetery Road is a 17 foot wide two way road which intersects North Main Street within Sherborn Center and provides access to both Pine Hill Cemetery and Town maintained recreational facilities on this dead-end road. Pine Hill Cemetery Road rises to meet North Main Street on a slight incline, and, due to the presence of overgrown vegetation on the incline, traffic exiting Pine Hill Cemetery Road experiences very poor sight distances in both directions on North Main Street.

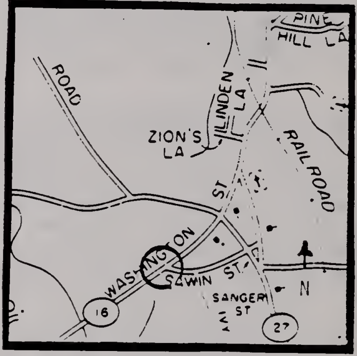


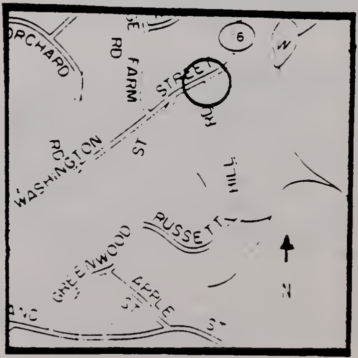
Maple Street is a 24 foot wide, two-lane street which intersects with Washington Street and Sanger Street about 600 feet to the west of Washington Street's intersection with South Main Street (Route 27). Sanger Street at this four-legged intersection is 19 feet wide, with two lanes. This intersection is situated near the crest of a hill on Washington Street in such a way that Maple Street and Washington Street EB rise as they approach the intersection; and Washington Street WB and Sanger Street fall as they approach the intersection. Washington Street WB and Sanger Street fall as they approach the intersection. Washington Street's approach is on a curve as well, and presents a very dangerous situation in which motorists on Washington Street WB are unable to see traffic entering or exiting Maple and Sanger streets in sufficient time to respond. The majority of accidents at this high accident location result from the poor sight distances, despite overhead illumination on both Washington Street and Maple Street. Both Washington Street and Maple Street are signed for "Slow, Dangerous Intersection" and Maple Street is signed "Be Prepared to Stop". In recent years efforts have been made by the Town of Sherborn to channelize traffic to and from Maple and Sanger streets by the introduction of islands at the intersection. The speed limit on Washington Street at the intersection with Maple and Sanger streets is 30 miles per hour.

Sawin Street is an 18 foot wide, two-lane road which intersects Washington Street at roughly a 50 degree angle. Sawin Street is a convenient through-street for traffic to and from Washington Street and South Main Street. Sight distances are good at Sawin Street's intersection with Washington Street, and this location does not have a history of accidents.

Russett Hill Road is a 26 foot wide residential street which, as mentioned earlier in this report, intersects Washington Street at the crest of a hill and at the end of an S-curve about 1500 feet in length. Poor sight distances, particularly





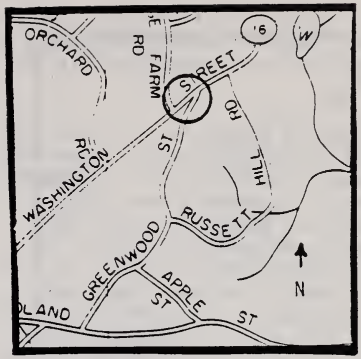


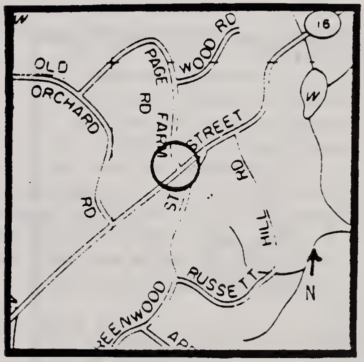
for WB traffic on Washington Street, create a hazardous opportunity at this location. Fortunately, traffic volumes on Russett Hill Road are low, resulting in few accidents at this location. The intersection is signed for "Dangerous Intersection" midway up the hill/S-curve on Washington Street WB, but the sign is small (about 2 feet square), is badly rusted, and is partially obstructed by overgrown vegetation.

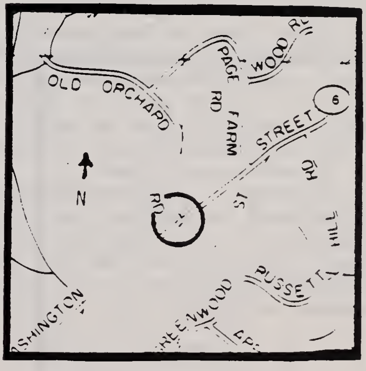
Greenwood Street is a 16 foot wide, two-lane road, which intersects Washington Street at a 20 degree angle. Sight distances to and from Greenwood Street are fair, and due to the very low volumes experienced on Greenwood Street, this intersection has a very low accident record.

Page Farm Road is a 26 foot wide residential street which experiences low traffic volumes and intersects Washington Street at a 90 degree angle. Sight lines to and from Page Farm Road are good, particularly during the daylight hours. After dark, this intersection has the potential for safety problems due to the 40 mile per hour speed limit on Washington Street at the intersection and the lack of overhead illumination on this densely wooded stretch of Washington Street. All evidence of a center dividing stripe on Washington Street has faded to the extent that the road appears undivided from Greewood Street to Woodland Street, a distance of 5,000 feet.

Old Orchard Road is a 27 foot wide residential street which intersects Washington Street at a 90 degree angle 1,000 feet of the west of Page Farm Road. The above description of Page Farm Road's intersection with Washington Street applies to

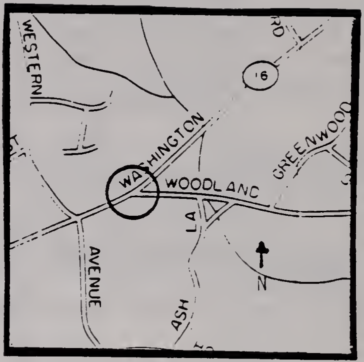




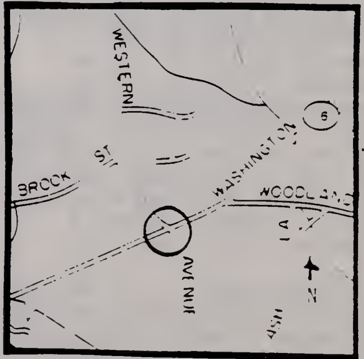


Old Orchard Road's as well, except that west of Old Orchard Road a 45 mile per hour speed limit is in effect.

Woodland Street is a 27 foot wide collector street which intersects Washington Street at a 45 degree angle, creating a fork and a somewhat hazardous situation, particularly for EB traffic on Washington Street in this 40 mile per hour speed zone. Washington Street has a sharp bend to the left in an easterly direction at this non-illuminated intersection, and though a large sign designates the direction of Route 16 at this location, a motorist must proceed cautiously in order to maintain his progression on Route 16 EB. Woodland Street's intersection with Washington Street involves a triangular dirt island, but no channelization of traffic past the island is imposed and WB traffic on Woodland Street is allowed to enter Washington Street WB, after coming to a stop, at an awkward angle which has resulted in angle and head-on collisions in the recent past.

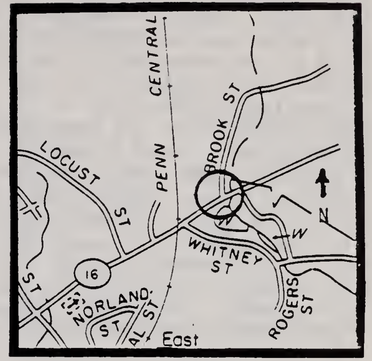


Western Avenue is an 18 foot wide, two-lane road which intersects Washington Street at a 90 degree angle, forming a four-legged intersection. Western Avenue is a principal route to Framingham to the north and is very heavily travelled for its width (the most recent MDPW traffic count was taken in 1972, at which time 6,200 vehicles daily travelled Western Avenue in the area of its Washington Street intersection). This intersection is illuminated and has very good sight distances in all directions, but the heavy traffic volumes and narrowness of Western Avenue have resulted in several serious accidents at this location.

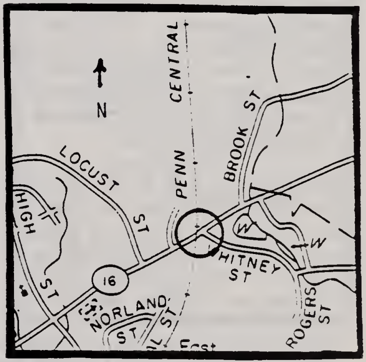


2. Holliston

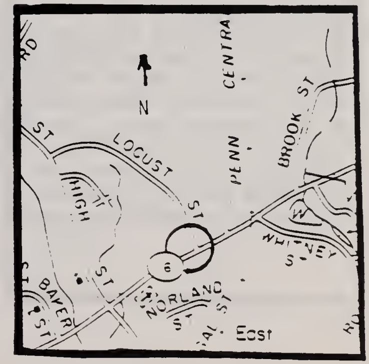
Brook Street is a 23 foot wide, heavily travelled street which intersects Washington Street at a 50 degree angle, forming a fork which results in one of the most serious safety concerns of the Route 16 corridor in the study area. Brook Street is the principal east-west connecting street to Western Avenue (as mentioned above) and as such is very heavily travelled in peak traffic periods. Washington Street is posted for a 35 mile per hour speed limit at this intersection, which is well illuminated. The hazardous nature of the intersection is directly related to the fork created by the two streets. Traffic on Washington Street EB tends to approach and turn onto Brook Street at high speeds, resulting in numerous angle collisions and a surprisingly high number of single vehicle accidents in which EB vehicles on Washington Street fail to negotiate the fork and leave the road.



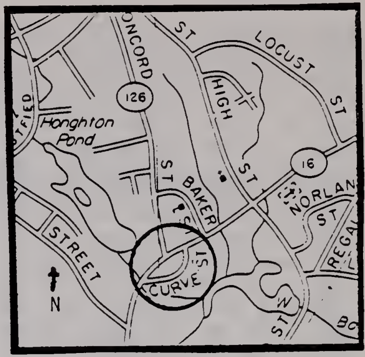
Whitney Street, a 17 foot wide, two-lane street leading to an industrial area, intersects Washington Street at a 50 degree angle from the south. The intersection is situated immediately east of an at-grade rail crossing. Traffic volumes on Whitney Street are relatively low, sight distances at the intersection are very good, and traffic entering and exiting Whitney Street is channeled around a slim concrete island. This intersection was rebuilt in 1984.



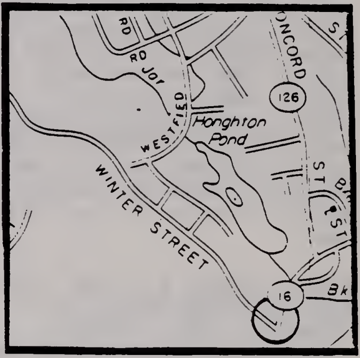
Locust Street is a 22 foot wide residential street which intersects Washington Street at a 90 degree angle, forming a three-legged 'T'. The intersection is situated just west of the crest of a slight hill, and sight distance problems are created for WB vehicles on Washington Street and for vehicles exiting Locust Street.



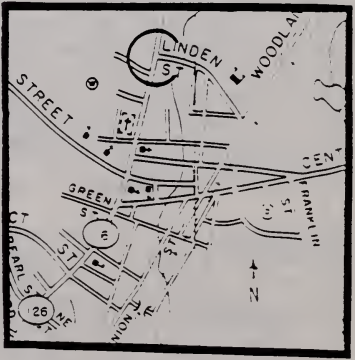
Curve Street is a 20 foot wide, one-lane, one-way street which is .14 mile long and provides access to the parking areas behind the commercial enterprises at the signalized intersection of Washington Street and Concord Street (Route 126). Curve Street intersects Washington Street in two distinct places, both before and after the Concord Street signals, and the opportunity is provided for Washington Street EB traffic to bypass the signals entirely via Curve Street. The dimensions of Curve Street, the lack of defined curb cuts to and from adjacent parking areas, and relatively high speeds of vehicles using the bypass have resulted in several serious accidents between those vehicles and vehicles entering and exiting the Curve Street parking areas, and between vehicles exiting Curve Street and vehicles passing on Washington Street EB.



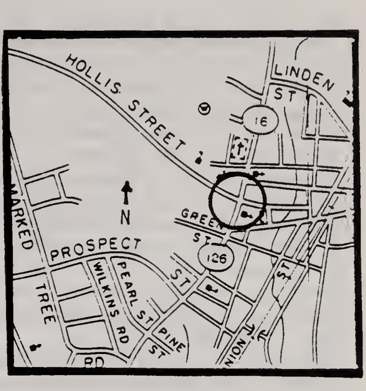
Winter Street is a 20 foot wide, two-lane street which intersects Washington Street at a 70 degree angle. Some sight distance problems occur at this location due to vegetation growth, and the narrow width of Winter Street at the intersection; but no significant safety problems exist there as a result.



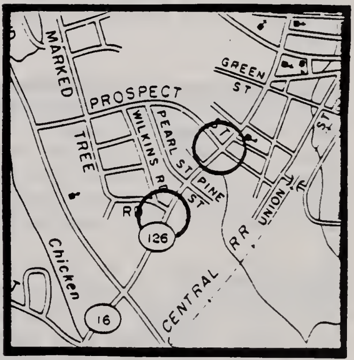
Linden Street is a 20 foot wide street which acts as a connector between the high-volume Woodland Street and Washington Street, and which intersects Washington Street at a 90 degree angle. The broad widths of Washington Street at this location allow for very good sight distances and the intersection poses no particular safety concerns.



Hollis Street is a 30 foot wide, two-lane street which intersects Washington Street at a 90 degree angle in Holliston Center. Traffic volumes on Hollis Street are high (7,500 vehicles daily as counted in 1978 by MDPW), and sight distances are good at the intersection. This intersection has a history of property accidents involving angle collisions between left and right-turning vehicles from Hollis Street and vehicles on Washington Street in both directions.

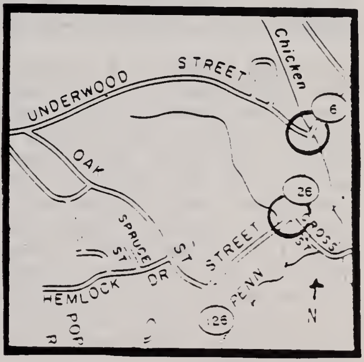


Prospect Street and Marked Tree Road are residential collector streets of 22 feet in width each which intersect with Washington Street at 90 degree angles and which pose no particular hazardous conditions.

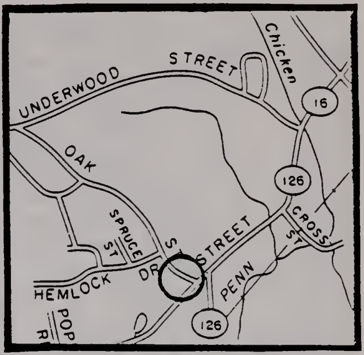


Underwood Street is a 20 foot wide, two-lane street intersecting Washington Street at a 90 degree angle on a slight curve. Sight distances are generally good here, but the curve in Washington Street and the proximity to the signalized Highland Street intersection (which is 1,00 feet to the east) have resulted in serious safety consequences, particularly under wet or icy road coniditions, with many angle and head-on collisions, and vehicles leaving the road.

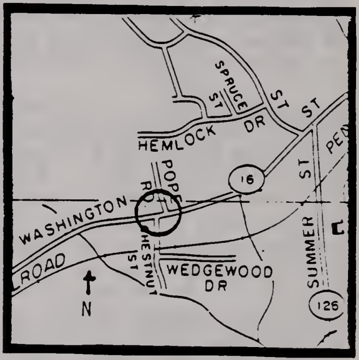
Cross Street is a 29 foot wide dead-end road leading to and from an industrial area. Cross Street's intersection with Washington Street, like Underwood Street's above, is situated on a sharp curve at the base of a long incline from the west, resulting in very poor sight distances on Washington Street and extremely hazardous conditions at the intersection for left and right-turning vehicles from Cross Street to Washington Street.



Oak Street is an extremely narrow (18 foot wide), two-lane street which intersects with Washington Street only 250 feet to the west of Summer Street (Route 126). Though not a part of the Summer Street intersection, Oak Street's intersection is close enough to contribute to and be a recipient of the congested and hazardous nature of the Summer Street intersection. Oak Street rises to meet Washington Street on a sharp incline, which, in addition to overgrown vegetation and poor illumination at the intersection, results in seriously deficient sight distances for vehicles turning left or right from Oak Street. A number of angle accidents have occurred there as a result.

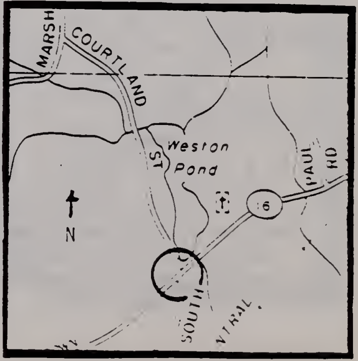


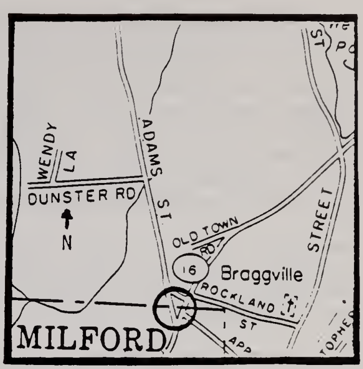
Pope Road is a 27 foot wide, dead-end unaccepted street which provides access to a small industrial park. With the possible exception of the industrial park's sign, no sight distance problems are encountered at this intersection.



Chestnut Street is an 18 foot wide dead-end street providing access to industrial parcels and intersecting Washington Street at a 90 degree angle less than 100 feet to the west of Pope Road. No particular sight distance or safety problems exist there.

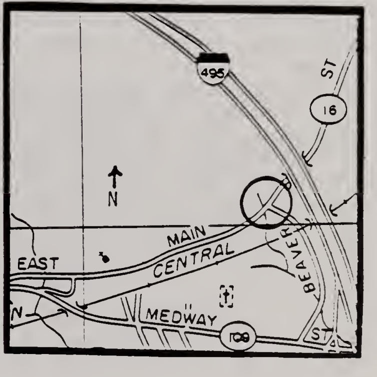
Courtland Street is a 16 foot wide, two-lane street which intersects Washington Street at a 90 degree angle, forming a four-legged intersection (with South Street) about 3,500 feet from the Milford town line. South Street provides north-south access to Medway and Route 109. Some sight distance problems exist at this intersection, but no particular safety problems have resulted due to the low volumes of traffic on both Courtland and South streets.





Adams Street is an 18 foot wide street which intersects Washington Street at the Milford town line at a 35 degree angle. A triangular island is formed at the intersection providing access to Washington Street in both directions, but no channelization of traffic is imposed. As a result, this intersection has been the site of a number of accidents involving EB traffic on Washington Street entering Adams Street at high speeds (the speed limit at this location is 45 miles per hour on Washington Street) and either leaving the road or being involved in angle or rear-end collisions.

3. Milford



Beaver Street is a 21 foot wide street which parallels I-495 to the west of that highway and provides access between Medway Street (Route 109) and East Main Street (Route 16). Beaver Street is heavily travelled and is in very poor structural condition. It is a primary access road form Route 16 to the I-495 ramps on Route 109, and its intersection with East Main Street at a 90 degree angle, though without serious sight distance problems, has a history of accidents of an angle or rear-end nature among vehicles entering and exiting Beaver Street to and from East Main Street.

C. Traffic-Related Accident Experience

Study area accident data on Route 16, as compiled by MDPW, have been analyzed during the course of this study for the three most-recent calendar years available of 1978 through 1980. Additional and more recent accident data was made available by the Holliston and Milford police departments during this study, but proved to be of limited use due to a lack of consistency and detail in data provided, and were used primarily for comparative purposes with the MDPW material.

The results of the accident data analysis, which are included in the Appendices to this report describe high accident intersections and locations, by volume and type, for the Route 16 corridor within the study area. A synopsis, by town, is provided below of that analysis.

1. Sherborn High Accident Locations

The single most hazardous location within the Route 16 corridor in Sherborn is the Y-intersection of Washington and North Main streets (Route 16 at Route 27). The unsignalized intersection, at which Routes 16 and 27 merge and diverge to the west of Sherborn Center, experienced a total of 57 separate accidents during the three year reporting period. This intersection is the most hazardous on the Route 16 corridor within the study area, based upon number of accidents, and had a total accident volume nearly twice that of the next most hazardous location on Route 16 in Sherborn. Most accidents at this location involved property rather than personal injury damage (88%), occurred during clear and dry weather conditions (84%), on weekdays (87%), during the afternoon hours of from 2:00 to 6:00 PM (54%), and can be attributed to the unsignalized nature of the intersection. Route 27 NB at the intersection is signed for a full stop. Fifty percent of all accidents at the intersection involved rear-end collisions of two or more vehicles at the Route 27 NB stop sign. Other accident types, in order of occurrence by volume at this location, were 1) angle accidents among EB vehicles on Route 16 and left-turning vehicles on Route 16 and left-turning vehicles from Route 16/27 to Route 27 SB; 2) rear-end collisions among WB vehicles on Route 16/27; 3) head-on collisions between Route 16 EB vehicles and left-turning vehicles from Route 16/27 to Route 27 SB; and 4) rear-end collisions among EB vehicles on Route 16.

The Y-intersection of North Main and Eliot streets (Route 16/27 at Route 16) is the second most hazardous intersection on the Route 16 corridor in Sherborn, in terms of the number of accidents experienced there. This signalized intersection had a total of 30 accidents during the reporting period, the majority of which were property rather than personal injury accidents. About 60 percent of all accidents at this location involved rear-end collisions among vehicles at any of the three traffic control signals, and 58 percent of all accidents occurred between the hours of 2:00 and 6:00 PM, on weekdays, and under a variety of weather and road surface conditions. Other accident types reported at this location, in order of frequency, included, but were not limited to angle collisions (23% of total) and head-on collisions (3% of total).

Other accident locations of note on Route 16 in Sherborn, and the volume and predominant type(s) of accidents experienced at those locations, included:

Washington Street at Maple and Sanger streets-
20, of which 70 percent were angle collisions.

North Main Street at Sherborn Center curb cuts-
14, of which 50 percent were angle collisions and 28 percent were rear-end collisions.

North Main Street at railroad tracks in Sherborn Center-
13, of which 70 percent were rear-end collisions.

Washington Street at Western Avenue-
8, of which 50 percent were angle collisions.

Washington Street at Woodland Street-
4, of which 50 percent were angle collisions.

For additional information on any above location see the accident analysis in the Appendices to this report.

2. Holliston High Accident Locations

The signalized four-legged intersection of Washington Street (Route 16) and Highland Street was the highest Route 16 accident location in Holliston during the three year reporting period. A total of 38 accidents were reported, 10 of which involved personal injury. About 53 percent of the accidents at this location involved angle collisions; followed in order of frequency by rear-end collisions (24%), vehicles leaving the road (16%), and head-on collisions (5%). Most reported accidents at this location occurred during the afternoon hours of 12:00 noon to 5:00 PM (53%), under clear and dry weather and road surface conditions.

The second highest accident location on Route 16 in Holliston was the unsignalized four-legged intersection of Washington Street at High and Woodland streets. Of the 32 accidents reported at this location, six involved personal injury. About 53 percent of all accidents involved angle collisions between left and right turning vehicles to and from High and Woodland streets and traffic on Washington Street. Other accident types at this location, by frequency of occurrence include rear-end collisions (19%), vehicles leaving the road (12%), and head-on collisions (6%). The majority of accidents at this location occurred during the afternoon hours of 1:00 PM to 6:00 PM (52%) under a variety of weather and road surface conditions.

Washington Street at Central Street experienced 31 accidents during the reporting period, 26 of which were property accidents. The reported accident experience of this unsignalized T-intersection in Holliston Center involved angle collisions (58% of total) between left or right turning vehicles and through vehicles on Washington Street, rear-end collisions (29%), and collisions with fixed objects (6%). Most reported accidents at this location occurred under clear and dry weather and road surface conditions (89%), but otherwise no trends were displayed in the data as to time of day and day of the week.

Washington Street at Brook Street is an unsignalized Y-intersection at the Holliston/Sherborn town line which, during the reporting period experienced 28 accidents, eight of which involved personal injury. Angle accidents (46%) predominated at this location, particularly between left-turning vehicles onto Brook Street from Washington Street EB and through traffic on Washington Street WB. Twenty five percent of reported accidents at this location involved left-turning vehicles from Washington Street EB failing to successfully negotiate the turn and leaving the road or hitting a fixed object. Other accident types, by frequency of occurrence, included rear-end collisions (18%) and head-on collisions (11%). Seventy percent of reported accidents at this location occurred under clear and dry weather and road surface conditions, but otherwise the accident data displayed no trends as to day of week or time of day.

Washington Street at Summer Street (Route 126) is an unsignalized T-intersection which experienced 25 accidents during the reporting period, eight of which involved personal injury. The predominant type of accident was an angle collision (56%), particularly between left-turning vehicles from Summer Street NB onto Washington Street WB and left-turning vehicles from Washington Street WB to Summer Street SB. Other accident types, by frequency of occurrence at this location, included vehicles on Summer Street NB failing to negotiate the intersection and leaving the road (24%), rear-end collisions (16%), and head-on collisions (4%). Seventy-five percent of all reported accidents occurred under clear and dry weather and road surface conditions, and fifty percent of all accidents involving a vehicle leaving the road at this location occurred during wet or snowy road surface conditions. Otherwise no trends in the data were displayed as to day of the week or time of day.

Washington Street at Concord Street (Route 126) is a signalized T-intersection which experienced 24 accidents during the reporting period. Most accidents at this location were property accidents (92%), and involved rear-end collisions at the three traffic control signals (41%), angle collisions between left-turning vehicles onto Concord Street NB and Washington Street through-trafffic (38%), or vehicles failing to negotiate the intersection and leaving the road (21%). Seventy percent of all reported accidents occurred under clear and dry weather and road surface conditions, fifty-five percent occurred between the afternoon hours of 1:00 PM and 5:00 PM, and thirty-two percent occurred between the hours of 9:00 PM and midnight.

Other accident locations of note on Route 16 in Holliston, by volume and the predominate accident type(s) experienced at these locations, include:

Washington Street at Underwood Street-
20, of which 35 percent involved a vehicle which had left the road or hit a fixed object; and 25 percent of which were head-on collisions, particularly during periods of wet or icy road surface conditions.

Washington Street at Hollis Street-
18, of which 67 percent were angle collisions.

Washington Street at Cross Street-
12, of which 33 percent were rear-end collisions, 25 percent of which were head-on collisions, and 25 percent of which were angle collisions.

Washington Street at Curve Street-
8, of which 37 percent were rear-end collisions, 25 percent were angle collisions, and 25 percent of which involved a vehicle which had hit a fixed object.

Washington Street at Chestnut Street-
8, of which 37 percent were rear-end collisions, 25 percent of which were angle collisions, and 25 percent of which involved vehicles having left the road.

Washington Street at Charles Street-
7, of which 100 percent were angle collision.

For more details on any of these above locations, see the accident analysis in the Appendices to this report.

Route 16 accident data provided by the Holliston Police Department for the calendar years 1982 and 1983 indicates that high accident locations during the period of 1978 to 1980 continued to be hazardous during 1982 and 1983. The fifth highest accident location during 1978-80, Washington Street at Summer Street (Route 126), was highest during 1982-83 with 14 accidents, 57 percent of which were angel collisions, 14 percent of which involved vehicles leaving the road, 14 percent of which involved rear-end collisions, and seven percent of which involved head-on collisions. These percentiles of accident occurence at this location, by type, remained remarkably consistent between the two reporting periods.

Washington Street at Hollis Street, the eighth highest accident location during the 1978-80 reporting period, was second highest in accident volume during 1982 and 1983 with 11 vehicular accidents, almost all of which involved angle collisions (91%). This percentile is compared to 67 percent during 1978-80.

The highest accident location during 1978-80, Washington Street at Highland Street, was third highest during 1982-83 with ten accidents. The majority of accidents at this locaiton involved angle and rear-end collisions (50%) and incidences of vehiclws leaving the road (20%) and head-on collisions (10%) which are consistent with the 1978-80 reporting period's percentiles.

Washington Street at Brook Street, the fourth highest accident location during 19778-80, remained the fourth highest location during 1982-83, with ten accidents, but was the highest accident location in terms of personal injury with 11 person injured in five accidents. Accident types during 1982-83 were rear-end collisions on Washington Street EB (40% of total), vehicles leaving the road (20%), head-on collisions (20%), and angle collisions (20%).

Washington Street at Cross Street, the ninth highest accident location during 1978-80, was fifth highest during 1982-83 with seven accidents. Of particular concern at this location is that three of these accidents involved vehicles leaving the road due directly to road surface conditions on this curving stretch of Washington Street.

Other accident locations of significance, as specified by the Holliston Police Department for the period of 1982-83 include:

Washington Street at Central Street-
6 accidents, of which 50 percent were rear-end collisions.

Washington Street at Concord-
5 accidents, of which 40 percent were rear-end collisions.

Washington Street at Underwood Street-
5 accidents, of which 40 percent were angle collisions.

Washington Street at Charles Street-
4 accidents, of which 100 percent were angle collisions.

Washington Street at Woodland and High streets-
4 accidents, of which 50 percent were angle collisions.

Washington Street at ABC Glass Company-
4 accidents, 75 percent of which involved a vehicle leaving the road, involving four injuries in the four accidents, and one fatality.

3. Milford High Accident Locations

The signalized Y-intersection of East Main Street (Route 16) and Medway Street (Route 109) experienced a total of 14 accidents during the 1978-80 reporting period, all of which were limited to property damage. The most frequent accident type of this location was the rear-end collision (64% of total) between vehicles at the traffic control signals, followed by angle collisions (23%). Seventy-three percent of all reported accidents at this location occurred during the hours of 11:00 AM to 3:00 PM.

East Main Street at Beaver Street was, until recently, a three-legged intersection. Fortune Boulevard, the fourth leg, has been recently built and provides access to Granite Industrial Park. During the reporting period this unsignalized T-intersection experienced ten accidents, the majority of which were property accidents. Accident types reported included angle collisions (50%), rear-end collisions (40%), and head-on collisions. No particular trends in accident occurence were displayed in the accident data otherwise.

East Main Street at Adams Street is an unsignalized Y-intersection at the Milford/Holliston town line which experienced seven accidents during the reporting period. The majority of accidents at this locatin involved vehicles leaving the road or hitting a fixed object (43%). No particular trends in accident occurrence were displayed in the accident data otherwise.

Accident data provided for the reporting period of 1978-80 in Milford includes a large number of accidents on Route 16 for which a specific location cannot be determined due to inexact or unspecified data. Accident information provided by the Milford Police Department for the calendar year 1983 show that of the 69 accidents reported on Route 16 in the Milford portion of the study area, the single highest accident location was at the curb cuts of the E-Z Way Car Wash, followed closely by the intersection of East Main Street and Beaver Street.

D. Planned Improvements to Route 16 Within the Study Area

There are at present no planned or programmed improvement projects of the Commonwealth on Route 16 within the study area, although one project now under design by MDPW which will affect the operations and capacity of the Route 16 corridor is the reconstruction of Medway Street (Route 109) in Milford form Birch Street to I-495. The $500,000 federally-funded projet is expected to be undertaken during FY 1985 and will include the widening of Route 109 to four lanes between I-495 and Birch Street, the signalization of the Route 109 and Beaver Street intersection, and other safety and capacity improvements.

Future planned projects on Route 16, as proposed by the developers of Hopping Brook Park in Holliston and Granite Industrial Park in Milford, entail the following:

1. Widening of Route 16 at the access drive to Hopping Brook park to allow for a protected left turn lane on Route 16 WB and a continuous right turn lane on Route 16 EB. Signalization of this T-intersection will be provide, consisting of a three-phase fully-actuated signal, the operation of which may not be required during off-peak traffic hours. According to the Final EIR for Hopping Brook Park, full development of the industrial park, specifically the final of the three development phases, will be contingent upon a complete reconstruction of Route 16 to provide for four lanes of travel in two directions form Route 16's intersection with Route 109 in Milford to Route 16's intersection with Concord Street (Route 126) in Holliston.

2. Signalization of the intersection of Route 16 with Fortune Boulevard and Beaver Street in Milford. Fortune Boulevard is the access drive to Granite Industrial Park from Route 16. This signalization project, as described in the Final EIR for the park, will not take place until average daily traffic on Fortune Boulevard reaches 6,000 vehicles daily and the park's development reaches 1,500,000 square feet of floor area (estimated to be about 1995).

E. Traffic to be Generated by New Development on and near Route 16

According to available documentation (EIRs, ENFs) for development projects proposed or under construction in the study area, the following average daily volumes of traffic are to be added to local roadways within the Route 16 corridor upon full development of projects listed below.

Project	Estimated New Average Daily Traffic (ADT)
Granite Industrial park, Milford	10,000
Hopping Brook Park, Holliston	36,900
Quarry Square Shopping Center, Milford	8,239
Beaver Street Hotel, Milford	950
Workmen's Circle Housing, Ashland	3,768
Estimated Total New ADT	59,857

IV. ROADWAY ADEQUACY

A. Capacity Analysis Methodology Employed

A roadway's capacity to handle a given volume of traffic can be described by the ability of the major intersections along that roadway to operate under peak traffic volume conditinos and periods. During this study intersection capacity and level of service definitions as developed by the Transportation Research Board of the National Academy of Sciences have been employed to compare the capacity of Route 16 with existing and anticipated traffic volumes and to determine existing and anticipated levels of service along Route 16 in the study area.

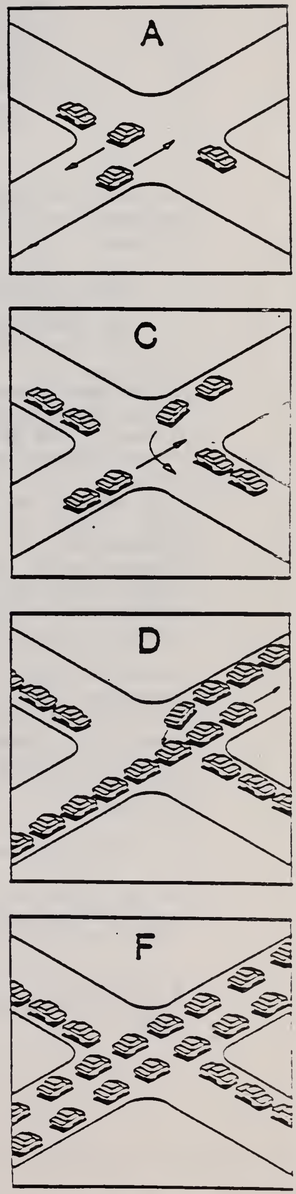
Level of Service (LOS) is a function of the relationship among the traffic volume, design capacity, and operating speeds of an intersection; and can be lossely described as a meausre of vehicle mobility in terms of speed and travel time, traffic interruption, freedom to maneuver, safety, driving comfort and convenience, and delays. Six levels of service are commonly accepted to represent a range of traffic flow conditions from flee flow (LOS A) to extremely congested conditions (LOS F), and are defined textually and graphically on the following page.

The analysis of an unsignalized intersection is essentially a gap analysis, or an assessment of the ability of a vehicle on a minor roadway to enter or cross traffic on a major roadway via a gap in that traffic. What results from the analysis is an estimate of the capacity of the minor street approach; and the degree to which that capacity varies from the current or projected peak traffic volumes is referred to as the intersection's reserve capacity. The intersection's reserve capacity is directly related to its LOS in that the higher the reserve capacity, the higher the LOS and the lower the expected traffic delay on that approach.

The analysis of signalized intersection is essentially a critical movement analysis and defines the LOS and capcity of the intersection based upon its geometry and signal timing and operation. The signal's ability to adequately discharge a line of vehicles past a specified point is at the heart of the analysis. Under optimal conditions a signal can discharge 1,500 to 1,800 passenger car vehicles per hour of green cycle time on a single 12-foot traffic lane. Variations in lane width or vehicular composition due to the presence of trucks and buses, pedestrian crossings, bus stopping, vehicle parking, vehicle turning movements, and variations in peak vehicle flows serve to diminish the above optimal discharge rate. The LOS of a signalized intersection, then, is a function of the resulting sum of critical volumes of discharges vehicles, dependent upon signal phasing in the following manner:

FIGURE 6
LEVEL OF SERVICE DEFINITIONS[2]

LOS	Roadway Segments or Controlled Access Highways	Intersections
A	Free flow, low traffic density, average traffic speed of 30 miles per hour or better.	No vehicle waits longer than one signal indication.
B	Delay is not unreasonable, stable traffic flow, average traffic speed is 25 miles per hour or better.	On a rare occasion motorists wait through more than one signal indication.
C	Stable condition, movements somewhat restricted due to higher volumes, but not objectionable for motorists, average traffic speed is 20 miles per hour or better.	Intermittently, drivers wait through more than one signal indication, and occasionally backups may develop behind left turning vehicles, traffic flow still stable and acceptable.
D	Movements more restricted, queues and delays may occur during short peaks, but lower demands occur often enough to permit clearing, thus preventing excessive backups. Average traffic speed is 15 miles per hour.	Delays at intersections may become extensive with some, especially left-turning vehicles waiting two or more signal indications, but enough cycles with lower demand occur to permit periodic clearance, thus preventing excessive backups.
E	Actual capacity of the roadway involves delay to all motorists due to congestion. Average traffic speed is 10 to 15 miles per hour.	Very long queues may create lengthy delays, especially for left-turning vehicles.
F	Forced flow with demand volumes greater than capacity resulting in complete congestion. Volumes drop to zero in extreme conditions.	Backups from locations downstream restrict or prevent movement of vehicles out of approach creating a storage area during part or all of an hour.



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[2] A Policy on Design of Urban Highways and Arterial Streets, [illegible]

FIGURE 7

MAXIMUM SUM OF CRITICAL VOLUMES[3]

LOS	Two Phase	Three Phase	Four or More Phase
A	1,000	950	900
B	1,200	1,140	1,080
C	1,400	1,340	1,270
D	1,600	1,530	1,460
E	1,800	1,720	1,650
F		Not Applicable	

Alteration in signal timing and lane configuration can, of course, improve the sum of critical volumes of a signalized intersection, and therefore the LOS.

B. Traffic Volumes

1. 1984 Base Traffic

1984 base traffic has been determined via field observations of peak period turning movements by MAPC at three signalized and four unsignalized intersections along the Route 16 corridor in the study area. Turning movements were counted between the hours of 7:00 AM and 9:00 AM; and 4:00 PM and 6:00 PM during September and October of 1984. Peak volume hours varied from intersection to intersection, but generally occurred between 7:15 and 8:15 AM, and 4:30-and 5:30 PM along the corridor in the study area. Truck volumes varied among the intersections but comprised approximately four percent of the AM peak traffic and two percent of the PM peak traffic along the corridor. Generally, total traffic volumes were higher during the PM than the AM peak hours at all intersections. Results of the traffic volume counts are included in the Appendices to this report.

Additional traffic volumes for the intersections of Beaver Street and Washington Street, and Medway Street and Washington Street in Milford were available from the final EIRs for both Granite Industrial Park and Hopping Brook Park. These volumes were taken during 1983 and 1982 respectively, and were factored by a two percent growth rate per year to 1984 levels to provide for consistency among the available volumes in subsequent analyses.

2. 1990 Projected Traffic

As was stated earlier in this report, available traffic volumes for 1984 were factored up by a two percent increase per year to 1990 projeted levels for analysis of corridor capacity at that time. This yearly increase is representative of the growth in traffic wihtin the study area and its immediate vicinity averaged over the past five years, and is also representative of average traffic growth in the Commonwealth during that period. Projected traffic volumes from available EIRs for both the Hopping Brook Park and Granite Industrial Park were also factored accordingly to 1990 levels to provide for a uniform projected traffic level for purposes of analysis.

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[3] Interim Materials on Highway Capacity, Transportation Research Board, 1980.

C. Existing Levels of Service

During this study four major signalized intersections and five major unsignalized intersections on Route 16 were assessed according to guidelines established by the Transportation Research Board (Circular #212, Interim Materials on Highway Capacity), using traffic volume, operating condition,and road configuration data gathered specifically for this study and similar data developed as part of recent development-related traffic studies undertaken within the study area. Levels of service were developed for each signalized and for selected unsignalized intersections, and they are presented on the following charts in geographic order, east to west. Signalized intersections are assigned a single overall LOS for AM or PM peak traffic periods, and unsignalized intersections are assigned two or more LOS for peak traffic periods, depending upon the number of intersection approaches and the number of prevailing turning movements.

FIGURE 8

ROUTE 16 SIGNALIZED INTERSECTIONS LEVELS OF SERVICE

Intersection Location	AM Peak LOS	PM Peak LOS
Eliot Street (Rute 16) at North Main Street (Route 16/27) SHERBORN	B	E
Washington Street (Route 16) at Concord Street (Route 126) HOLLISTON	C	E
Washington Street (Route 16) at Highland Street HOLLISTON	C	D
East Main Street (Route 16 at Medway Street (Route 109) MILFORD	A	A

FIGURE 9

ROUTE 16 UNSIGNALIZED INTERSECTIONS LEVELS OF SERVICE

Intersection Location	Movement	AM Peak LOS	PM Peak LOS
Washington Street (Route 16 at South and North Main streets (Route d16/27) SHERBORN	Left turns from North Main Street WB	C	D
	Right turns from South	D	B
Washington Street (Route 16) at Woodland and High streets HOLLISTON	Left turns from Washington Street EB	A	A
	Left turns from Washington Street WB	A	B
	Left turns the through moves from either Woodland or High streets	E	E
	Right turns from High St.	A	A
	Right turns from Woodland	B	
Washington Street (Route 16) at Central Street HOLLISTON	Left turns from Washington Street WB	D	C
	Left turns from Central Street NB	C	B
Washington Street (Route 16) at Summer Street (Route 126) HOLLISTON	Left turns from Washington Street WB	A	B
	Left turns from Summer Street NB	A	B
	Right turns from Summer Street NB	D	A
East Main Street (route 16 at Beaver Street MILFORD	Left turns from East Main Street WB	A	A
	Left turns from Beaver Street NB	A	B
	Right turns from Beaver Street NB	A	A

D. Capacity Analysis - 1984

The analyzed intersections are presented below in geographic order, east to west, by community.

Eliot Street (Route 16) at North Main Street (Route 16/27, SHERBORN

This signalized, three-legged intersection experiences AM peak traffic volumes of 1,976 vehicles between 7:30 and 8:30 AM; and PM peak traffic volumes of 2,037 vehicles between 4:45 and 5:45 PM. During the AM peak this intersection has an LOS of B (liitle or no delay) from each of the three approaches, with a volume to capacity ratio of .68. The two-phase signal at this location allows for a constant right turn arrow (except for infrequent manually-activated pedestrian phases) on an exclusive right turn land on North Main Street EB to Eliot Street EB. Some queuing is evident on North Main Street EB during the AM traffic peak, which presents a problem for vehicles on North Main Street EB destined for the exclusive right turn lane to Eliot Street. Queues can extend as far west of the signal as Devitt's Auto Sales (about 200 feet), and in that the exclusive right turn lane is about 100 feet in length, right-turning vehicles often bypass queued vehicles by proceeding upon the right hand shoulder of North Main Street in order to enter the exclusive right turn land without delay. During the PM peak hour this intersection experiences an LOS of E (intersection failure) and a volume to capacity ratio of .94. This intersection's PM peak hour failure is most evident in the very long queues of vehicles at the signal on North Main Street WB. These queues can extend as far east of the signal as Coolidge Street (about 2,500 feet in distance). Queues on Eliot Street WB to North Main Street WB are also in evidence, but are not as lengthy as those on North Main Street.

Washington Street (Route 16) ar North and South Main Streets, SHERBORN

This unsignalized three-legged intersection experiences AM peak traffic volumes of 1,929 vehicles and 2,069 vehicles during the PM peak. Traffic on Route 16 both EB and WB at this intersection flows freely. Of particular concern at this location is its capacity for allowing left turns from North Main Street to South Main Street (Route 27), and its capacity to provide for right turns from South Main Street to North Main Street. During the AM peak traffic hour vehicles on North Main Street WB turning left onto South Main Street experiences an LOS of C (average traffic delay). Vehicles on South Main Street making a right turn onto North Main Street at the stop sign experience an LOS of D and considerable delay and queuing due to a peak traffic volume of 614 vehicles attempting to pass through an intersection in which capacity for this movement is only 342 vehicles per hour. During PM peak periods left-turning vehicles from North Main Street WB to South Main Street experience long delays, an LOS of D, and a volume to capacity ratio of .8. Vehicles on South Main Street EB seeking to make a right turn onto North Main Street during the PM peak experience an LOS of B (little or no delay).

Left turns from South Main Street to Washington Street WB are very few in number (no more than one or two during peak hours) due to prior opportunities provided to vehicles on South Main Street to proceed west on Washington Street via Sanger or Sawin streets, and therefore are of little consequence to the capacity and operations of this intersection. There is evidence that vehicles making the left turn from South Main Street WB do affect the safety of this intersection in that this movement is both awkward and dangerous to maneuver, and has resulted in serious angle collisions in the past.

Washington Street (Route 16) at Woodland and High street, HOLLISTON

This unsignalized, four-legged intersection experiences AM peak traffic volumes of 1,797 vehicles between 7:15 and 8:15 AM; and PM peak traffic volumes of 1,788 vehicles between 4:30 and 5:30 PM. About 68 percent of the AM peak traffic and 89% of the PM peak traffic are vehicles approaching the intersection on Washington Street. Traffic on Washington Street flows freely and vehicles making either right or left turns from Washington Street experience LOS of A in the AM, and A or B in the PM peak period. Vehicles turning right from either Woodland or High streets onto Washington Street experience LOS of A or B in both the AM and PM peak periods, but vehicles making left turns or through movements from either approach experience LOS of E (failure) due to steady and conflicting flows on Washington Street in both directions. Traffic turning left onto Washington Street from both Woodland and High streets must share a lane with right-turning and through vehicles from either street. Woodland Street exceeds its shared lane capacity by about 70 percent and High Street exceeds its shared lane capacity by about 46 percent.

Woodland Street is a principal access and egress route to the Lowland Street industrial area of East Hollilston as well as part of an informal but heavily travelled bypass of Holliston Center to the south of Washington Street. High Street, on the other hand, is a very narrow but heavily travelled bypass of the Concord and Washington streets signalized intersection for vehicles destined for Washington Street EB or Woodland Street and the Lowland industrial area. The over-capacity conditions of the intersection are compounded by the slight skew at which Woodland Street and High Street intersect Washington Street.

Washington Street (Route 16) at Concord Street (Route 126), HOLLISTON

This signalized three-legged intersection provides for three signal phases with directional split, and experiences traffic volumes of 1,861 vehicles in the AM peak and 1,853 vehicles in the PM peak. Its AM LOS is C (average traffic delay) with volume to capacity ratio of .75, but its PM LOS is E (failure) with a volume to capacity ratio of .99. Washington Street EB and Concord Street SB each have two approach lanes at the intersection; Washington Street providing an exclusive left and right turn lanes onto Washington Street in either direction. The PM failure of this intersection is most evident in the queuing of vehicles on Washington Street, particularly on the exclusive left turn lane to Concord Street NB, where PM capacity is exceeded by over 200 percent.

Washington Street (Route 16) at Central Street, HOLLISTON

This unsignalized, three-legged intersection in Holliston Center experiences average traffic volumes of 2,021 vehicles during the AM peak and 2,311 vehicles during the PM peak traffic periods. Central Street intersects Washington Street in a perpendicular manner at this location, and is signed for a complete stop at the intersection. An overhead blinking signal is provided above the intersection on Washington Street, and blinks yellow in both directions on Washington Street and blinks red toward Central Street. Washington Street WB has two approach lanes at the intersection, one of whihc is an exclusive left turn lane to Central Street SB. Both Washington Street EB and Central Street have one approach lane. East and westbound traffic on Washington Street flows relatively smoothly. The capacity problems at this location occur at both the exclusive left turn lane from Washington Street have one approach lane. East and westbound traffic on Washington Street flows relatively smoothly. The capacity problems at this location occur at both the exclusive left turn from Washington Street to Central Street, and the left and right turns from Central Street, and the left and right turns from Central Street to Washington Street. Left turns from Washington Street to Central Street have a LOS of D (long delays) in the AM peak and C (average traffic delay) in the PM peak. Right turns from Central Street to Washington EB have LOS of C in the AM peak and B in the PM peak; and left turns from Central Street have LOS of E (failure) in both the AM and PM peaks. The exclusive left turn lane on Washington Street WB is under capacity by about 50 percent in the AM peak and by about 35 percent in the PM peak, but heavy traffic on Washington Street EB, particularly in the AM, causes considerable queuing and delay in this lane. The shared right and left turn lane on Central Street NB, on the other hand, is over capacity by 300 percent in the AM and by 450 percent in the PM. Vehicles approaching the intersection on Central Street must contend with poor sight distances as well due to parked vehicles on Washington Street to the immediate east and west.

Washington Street (Route 16) at Highland Street, HOLLISTON

This signalized, four-legged intersection has traffic volumes of 1,888 vehicles in the AM peak and 1,947 vehicles in the PM peak. About 73 percent of the AM traffic and 76 percent of the PM traffic approaches the intersection on Washington Street from either direction. The two-phase signals at this location provide for a LOS of C in the AM peak with a volume to capacity ratio of .72; and a LOS of D in the PM peak with a volume to capacity ratio of .85.

Washington Street (Route 16) at Summer Street (Route 126), HOLLISTON

This unsignalized, three-legged intersection has an average traffic volume of 1,436 vehicles in the AM peak and 1,735 vehicles in the PM peak. Traffic on Washington Street in either direction passes freely at this location, and constitutes about 75 percent of all approaching traffic in the AM peak and 88 percent of approaching traffic in the PM peak. Left turns from Washington Street WB to Summer Street SB experience a LOS of A in the AM peak and B in the PM peak. Right turns from Summer Street to Washington Street EB have LOS of D in the AM peak and A in the PM peak. Right turns from Summer Street to Washington Street far outnumber left turns (24 to 1 in the AM, and 5 to 1 in the PM) and left turns from Summer Street have at their disposal both a shared lane with right-turning vehiclws and a lane fo their own to the left of a large dirt traffic island at this location. Despite this, left-turning vehicles experience an LOS of D in the AM peak and E in the PM peak.

East Main Street (Route 16) at Beaver Street, MILFORD

This three-legged, unsignalized intersection (which will become four-legged upon the opening to traffic of Fortune Boulevard) is located at the southern entrance to Granite Industrial Park and experiences traffic volumes of 641 vehicles in the AM peak and 863 vehicles in the PM peak. Present demand is very much below capacity at this intersection and traffic making turns from both Washington Street and Beaver Street experience an LOS of A in the AM peak and either A or B in the PM peak; the latter being left turns from Beaver Street NB.

East Main Street (Route 16) at Medway Street (Route 109), MILFORD

This four-legged, signalized intersection (the fourth leg of which, Prairie Street, is a dead-end street and does not figure appreciably in the capacity and operations of this intersection) experiences traffic volumes of 827 vehicles in the AM peak and 1,354 vehicles in the PM peak. Levels of Service for this intersection are A for both AM and PM peaks, and the volume to capacity ratios are .31 in the AM peak and .57 in the PM peak.

E. Capacity Analysis - 1990

The capacity analyses of the following Route 16 intersections use as their data base 1984 traffic volumes and turning movements which have been projected via methods described elsewhere in this report to 1990 level, and to which have been added traffic volume estimates (projected up or factored down to 1990 levels) and traffic assignments as available from the Final EIRs for both the Granite Industrial Park and Hopping Brook Park development projects.

Eliot Street (Route 16) at North Main Street (Route 16/27), SHERBORN

This signalized intersection will, in 1990, handle 17 percent more traffic in the AM peak hour, and 40 percent more traffic in the PM peak hour, than it currently handles. It will have a 1990 AM peak LOS of C (average traffic delay) with a volume to capacity (v/c) ratio of .79, and a PM peak LOS of F (failure) with a v/c ratio of 1.06. What this implies is that the intersection, which is at present operating as efficiently as is possible within existing intersection geometrics, will be marginally more congested in the AM peak, particularly on its North Main Street EB approach; and will have even longer queues of vehicles during the PM peak at the Eliot Street and North Main Street WB approach signals.

Washington Street (Route 16) at North and South Main streets (Route 16/27), SHERBORN

This intersection will by 1990 handle 17 percent more traffic in the AM peak and 20 percent more traffic in the PM than it does at present. If the intersection remains unsignalized and within its existing geometrics it will have a 1990 AM peak LOS of D (long traffic delay) and a v/c/ ratio of .64 for left-turning vehicles from North Main Street WB to South Main Street; and an LOS of E (failure) for left or right-turning vehicles from South Main Street to North Main Street or Washington Street. 1990 PM peak LOS will be E for all movements at this intersection.

Should an exclusive left turn lane be provided on North Main Street WB to allow for left turns to South Main Street and improved through-movement of vehicles to Washington Street WB, then the above LOS remain the same but through-movements to Washington Street are improved. If a two phase traffic control signal were installed at this intersection within its existing geometrics, the 1990 AM and PM peaks LOS will be D with v/c ratios of .89 and .88 respectively. If a directional split phase are added to the signal in addition to the exclusive left turn lane from North Main Street to South Main Street, then the AM and PM peak LOS will be E, with v/c ratios of .92 and .91 respectively. What this implies is that signalization of this intersection will augment overall traffic flow and safety conditions, except during AM and PM peak hours when it may create congested conditions and long queues, and in turn interfere with the peak operations of the Eliot Street/North Main Street signal about 2,000 feet to the east.

Washington Street (Route 16) at Woodland and High streets, HOLLISTON

This four-legged, unsignalized interseciton will handle 20 percent more traffic in the AM peak and 25 percent more traffic in the PM peak in 1990 than it does at present. It will have 1990 AM peak LOS of A for vehicles on Washington Street EB and an LOS of B on Washington Street WB. Left turn, right turn, and through-movements from either Woodland or High street will experience LOS of E during the AM peak. During the PM peak Washington Street EB traffic will have an LOS of A while Washington Street WB traffic will have an LOS of E due to the volume to left turns to Woodland Street (entailing 44 percent of all movements) at this intersection. Again, PM peak left turn, right turn, and through-movements from Woodland and High streets will have an LOS of E.

Right turns from Woodland Street to Washington Street EB entail about 80 percent of all movements from this approach in the AM peak, and 52 percent in the PM peak. The 1990 AM peak LOS for right turning vehicles from Woodland Street will be D, and the PM peak LOS for this movement will be B. Adding an exclusive right turn lane to Woodland Street to allow for unhindered right turns to Washington Street EB will not noticeably improve the above AM or PM peak LOS, and left turn and through-movements in the other lane will remain at an LOS of E for both peak periods. Right turns form High Street to Washington Street WB are so few in occurrence that an exclusive right turn lane on High Street may not be necessary or advisable.

Signalization of the intersection, with an exclusive right turn lane on Woodland Street, will provide for an AM peak LOS of F (failure) whether or not directional split is provided for vehicles on Washington Street. In the PM peak signalization will allow for an LOS of D without directional split, and an LOS of F with directional split. In that the Washington Street and Woodland/High street intersection is about 1,250 feet from the Washington Street and Concord Street signalized intersection, signalization may not be advisable in terms of progressive traffic flow along Route 16. The Institute of Transportation Engineers recommends that signals not be less than 1,000 feet apart for this reason. If signalization is installed at this location its phasing should be carefully timed to allow for optimal vehicle flow on Washington Street.

Washington Street (Route 16) at Central Street, HOLLISTON

This unsignalized three-legged intersection will handle 30 percent more traffic inthe AM peak and 84 percent more traffic in the PM peak in 1990 that it does at present. It will provide for a 1990 AM peak LOS of D for left-turning vehicles from Washington Street WB to Central Street, and an LOS of E for left or right-turning vehicles from Central Street to Washington Street. 1990 PM peaks LOS will be E for the above turning movements.

Signalization of this intersection would provide for LOS of F in both the AM and PM peaks, with v/c ratios of 1.15 and 2.03 respectively. Adding an exclusive left or right lane on Central Street will provide for LOS of E in the AM and PM peaks on Central Street if the intersection remains unsignalized.

Washington Street (Route 16) at Highland Street, HOLLISTON

This signalized, four-legged intersection will handle 49 percent more traffic in the 1990 AM peak and 64 percent more traffic in the PM peak than it does at present. 1990 AM and PM peak LOS will be F (failure) with v/c ratios of 1.11 and 1.47 respectively. Providing either exclusive left or right turn lanes on Highland Street or Washington Street in any direction at this intersection does not improve the above LOS of F in the AM or PM peak.

Washington Street (Route 16) at Summer Street (Route 126), HOLLISTON

This unsignalized, three-legged intersection will handle 82 percent more traffic in the 1990 AM peak and 64 percent more traffic in the PM peak than it does at present. 1990 AM peak LOS will be D for vehicles turning left from Washington Street WB to Summer Street SB, and will be E for vehicles turning left or right from Summer Street NB to Washington Street. 1990 PM peak LOS will be E for all above movements.

Signalizing this interseciton will provide for a 1990 AM peak LOS of D, with a v/c ratio of .82; and a PM peak LOS of F with a v/c ratio of 1.24. Signalization would not improve AM peak LOS, and would make PM peak LOS marginally worse. Adding an exclusive left or right turn lane to Summer Street NB will provide for a LOS of E for both movements during both the AM and PM peaks, if the intersection remains unsignalized.

East Main Street (Route 16) at Beaver Street and Fortune Boulevard, MILFORD

This unsignalized intersection will handle 356 percent more traffic in the 1990 AM peak, and 304 percent more traffic in the 1990 PM peak than it does at present. 1990 AM peak LOS will be A for vehicles on East Main Street in either direction. Right turns from either Fortune Boulevard or Beaver Street will experience LOS of A, but left turns from either street will have LOS of E in the AM peak. In the 1990 PM peak vehicles on Washington Street WB will experience LOS of A, but vehicles on Washington Street EB will have an LOS of C. Again, right turns from either Fortune Boulevard or Beaver Street will have LOS of A, and left-turning vehicles from either street will have LOS of E in the PM peak.

Signalization of this intersection will provide for an LOS of F in both the AM and PM peaks, with v/c ratios of 1.05 and 1.01 respectively.

East Main Street (Route 16) at Medway Street (Route 109, MILFORD

This signalized intersection will, in 1990, experience an AM peak traffic increase of 77 percent, and a PM peak traffic increase of 39 percent over present levels. 1990 AM peak LOS will be A with a v/c ratio of .52; and the 1990 PM peak LOS will be D with a v/c ratio of .86.

FIGURE 10

COMPARISON OF 1984 AND 1990 ROUTE 16 LOS

		AM PEAK LOS		PM PEAK LOS	
Intersection Location	Movement	1984	1990	1984	1990
Eliot Stree (Route 16) at North Main Street (Route 16/27) SHERBORN		B	C	E	F
Washington Street (Route 16) at North Main Street (Route 16/27) SHERBORN	Left turn from N. Main St. WB	C	D	D	E
	Right turn from s. Main St. EB	D	E	B	E
Washington Street (Route 16) at Woodland and High streets HOLLISTON	Left turn from Wash. St. EB	A	A	A	A
	Left turn from Wash. St. WB	A	B	B	E
	Left turn and through-movement from Woodland of High streets	E	E	E	E
	Right turn from High Street	A	A	A	A
Washington Street (Route 16) at Concord Street (Route 126) HOLLISTON		C	E	E	F
Washington Street (Route 16) at Central Street HOLLISTON	Left turn from Wash. St. WB	D	D	C	E
	Left turn from Central St. NB	E	E	E	E
	Right turn from Cental St. NB	C	E	B	E
Washington Stree (Route 16) at Highland Street HOLLISTON		C	F	D	F
Washington Street (Route 16) at Summer Street (Route 126) HOLLISTON	Left turn from Wash. St. WB	A	D	B	E
	Left turn from Summer St. NB	D	E	A	E

COMPARISON OF 1984 AND 1990 ROUTE 16 LOS (CONT.)

Intersection Location	Movement	AM PEAK LOS 1984	AM PEAK LOS 1990	PM PEAK LOS 1984	PM PEAK LOS 1990
East Main Street (Route 16) at Beaver Street MILFORD	Left turn from E. Main St. WB	A	A	A	A
	Left turn from E. Main St. EB	-	A	-	C
	Left turn from Beaver St. NB or Fortune Blvd.	A	E	B	E
	Right turn from Beaver St. or Fortune BLVD.	A	A	A	A
East Main Street (Route 16) at Medway Street (Route 109) MILFORD		A	A	A	D

V. RECOMMENDED IMPROVEMENTS

The preceding intersection capacity analyses collectively illustrate that the Route 16 corridor within the study area is rapidly approaching its design capacity, and may exceed its capacity at some strategic locations in the near future, based upon known current and projected traffic volumes. The capacity scenarios presented may be conservative in that the study area will probable be the recipient of more development than is highlighted within these pages, and consequently, more traffic. Route 16 is an early and important radial artery of the metropolitan Boston region which, on its present alignment, may not safely or adequately handle the traffic loads resulting from the development which the study area may attract and support.

Certain ameliorative measures, both general and location-specific, may be considered by the study area communities and by the Commonwealth for the purpose of providing a safer and less congested traffic environment than may result under existing conditions. Recommended improvements are offered below, by community, and for the study area as a whole, for consideration. Where applicable, both immediate and future recommendations for a location are provided, with estimates of related costs. Al cost estimates were assigned by a highway engineer experienced in costing, who was consulted during the course of this study. A discussion is also presented of funding sources.

A. Sherborn

1. The traffic control signals at the North Main Street and Eliot Street intersection should be replaced with new fully actuated signal equipment providing for a manually activated pedestrian phase, which meets the standards defined by the Manual of Uniform Traffic Control Devices for such an intersection. Until the existing signals may be replaced, particular attention should be given to routine maintenance of the signals to provide for optimal and accurate signal phasing and timing. At present the signal operates on a 75 second cycle rather than the standard 60 or 90 second cycle; the latter of which is recommended.

   Estimated cost of replacement signals: $25,000 to $30,000

2. The exclusive right turn lane on North Main Street EB at the North Main Street and Eliot Street intersection should be lengthened by about 125 feet (or approximately to Devitt's Auto Sales' property) to provide for improved access to this lane and reduced queuing on North Main Street EB, particularly in the AM peak hour. This recommendation could best be implemented by widening North Main Street, assuming sufficient right-of-way, from its present 24 foot width (providing for three 8 foot wide lanes) to 33 feet (providing for three 11 foot wide lanes) from the signals to Devitt's, a distance of about 625 feet. Until the time that the above widening project may be undertaken all lane, crosswalk, and stop line striping at this intersection should be reapplied for improved visibility of same.

   Estimated cost of widening project: $50,000 to $60,000

3. Alternative vehicle circulation and access/egress patterns should be considered for the parking area in front of the Sherborn center post office/pharmacy commercial plaza in order to improve the circulation and safety hindrance created by the proximity of the Powderhous Lane egress from the pakring arera to the signals at the North Main Street and Eliot Street intersection (about 450 feet to the east). Ideally, coordination of the parking areas of all commercial establishments to the north of North Main Street in Sherborn center should be considered to provide for optimal safety and circulation of vehicles, but this recommendation will require further study by the Town of Sherborn.

4. The at-grade rail crossing on North Main Street in Sherborn center should be reconstructed to provide for smoother and safer traffic movement over this crossing, and future consideration should be given to modifying the S-curve within which North Main Street crosses the rails.

   Estimated cost of a reconstructed rail crossing: $25,000 to $30,000

5. The intersection of North Main Street at South Main Street and Washington Street should be reconstructed and realigned to provide for an exclusive left turn lane from North Main Street WB to South Main Street SB. Signalization of the intersection should also be included in this project, for which the minimum vehicle volume, accident experience, and systems warrants are met (the last of which justifies signalization at the intersection of any two major thoroughfares). Signalization should entail fully actuated equipment providing for two phases; the first of which would allow through-movement from Washington Street to North Main Street, and the second of which would allow for both left turns to South Main Street from North Main Street and right turns from South Main Street to North Main Street. Through movements from North Main Street to Washington Street WB could be provided a constant green arrow. Special consideration should be given to coordinating the timing of the proposed signals at this intersection with the existing signals at North Main Street's intersection with Eliot Street (2,000 feet to the east) in order to provide for optimal vehicle movement through Sherborn center during peak periods.

   This intersection should also be signed to prohibit the very infrequent and dangerous left turns from South Main Street to Washington Street WB, and right turns from Washington Street EB to South Main Street SB.

   Estimated cost of intersection reconstruction and signalization, exclusive of land-takings: $90,000 to $110,000

6. The intersection of Washington Street with Maple and Sanger streets should ideally be reconstructed on a different alignment about 50 to 100 feet to the west of its present location. Land for this alignment is currently open on both sides of Washington Street, and the land on the southern side of Washington Street already belongs to the Town of Sherborn. Realignment would provide for improved approach grades and sight lines from all four directions at this hazardous intersection. The Sanger Street approach of this intersection is particularly inadequate and involves three poorly channelized lanes around two informal traffic islands, one of which contains a telephone pole and the other of which contains both a sizeable tree and a stop sign. Efforts of the Town of Sherborn to date in improving sight lines, approach grades, and vehicle channelization at the existing intersection have been only moderately successful, and the extremely hazardous nature of the intersection remains. A pole-mounted mirror on the Maple Street approach of about 24 inches in diameter is of little use to approaching vehicles on Maple Street because of its unstability and inadequate size and prominence. At present the mirror provides a view of Washington Street's EB lane rather than the WB lane, the latter of which is of primary concern to vehicles turning from Maple Street to Washington Street. Improved and more extensive overhead illumination is warranted at this intersection in the meantime, and consideration should be given to providing a suspended intermittent warning light above the existing intersection which would be visible to vehicles approaching the intersection on Washington Street in either direction.

   Estimated cost of reconstruction, exclusive
   of land-takings: $130,000 to $150,000

7. Overhead illumination of the S-curve just east of the Russett Hill Road intersection with Washington Street should be provided, as should improved warning signing of both the S-curve and the hazardous nature of the Russett Hill intersection, particularly on Washington Street WB. Consideration should also be given to reducing the 40 mile per hour speed limit on this dangerous section of Washington Street. Long term consideration should be given to modifying both the alignment and poor sight lines of the S-curve on what is a relatively steep hill.

8. The 0.8 mile long portion of Washington Street between Old Orchard Road and Western Avenue should be resurfaced with a one to two inch overlay. Overhead illumination should be provided on this stretch of Washington Street, and additional improvements should be provided at the Washington Street and Woodland Street Y-intersection to allow for adequate lane width and channelization of all vehicles on Woodland Street to the right of th existing traffic island. The traffic island should be better defined by curbing and signing, including the placement of a stop sign to the right of the island on the Woodland Street approach, and drainage improvements are also warranted there. Sight distances and existing overhead illumination should also be improved at this intersection. Pending these improvements, Washington

Street between Old Orchard Road and Woodland Street should be restriped with a broken center dividing line, and consideration should be given to reducing the speed limit there (which is one the few segments of Route 16 in the study area within which passing is allowed) from 45 miles per hour to 40 or even 35 miles per hour to provide for a uniform speed limit between Sawin Street and the Holliston town line.

Estimated cost of resurfacing and improvements to the Woodland Street traffic island: $28,000 to $35,000

9. The Western Avenue intersection with Washington Street should be reconstructed to provide for widened (from 18 to 20 or 22 feet) and realigned approaches on Western Avenue so that the northern approach intersects Washington Street at a 90 degree angle, in conformance with the southern approach of Western Avenue. Channelization of traffic to and from both approaches of Western Avenue around traffic islands should be provided, as should improved overhead illumination and possibility a suspended intermittent warning signal. The 40 mile per hour speed limit should be reduced to 35 miles per hour in this area on Washington Street.

   Estimated cost of reconstruction: $24,000 to $50,000

10. The entire length of Route 16 in Sherborn portion of the study area should be restriped to provide for improved visibility of center dividing lines.

11. The entire length of Route 16 in the Sherborn portion of the study area (3.08 miles) should be provided with overhead illumination in accordance with standards appropriate to the road and the various land uses along Route 16. Should illumination of the entire length of Route 16 in the study area not be pursued, specific areas of Route 16 which should be the recipient of new or improved illumination are Sherborn center from Eliot Street to Maple Street, the S-curve east of Russett Hill Road (including the Russett Hill Road intersection), and the 0.8 mile section of Route 16 from Old Orchard Raod to Western Avenue.

B. Holliston

1. Brook Street's Y-intersection with Washington Street should be realigned to provide a Brook Street approach which is at a 90 degree angle to Washington Street. Wetlands to the immediate east of the Brook Street intersection may present problems with implementing this recommendation, and a more detailed assessment of traffic loads to and from Brook Street in peak traffic periods will need to be undertaken to determine what accompanying measures may need to be taken to offset possible queuing problems on a realigned Brook Street and on Washington Street EB. Until such time that a realignment of Brook Street may be undertaken, this Y-intersection should be signed as a dangerous intersection on each Washington Street approach, sight lines should be improved (particularly on the Washington Street WB and Brook Street approaches), and the stop sign on Brook Street should be relocated for higher visibility at a well-defined stop line under improved overhead illumination.

   Estimated cost of the above realignment: $25,000 to $50,000

2. The at-grade rail crossing on Washington Street just west of the Whitney Street intersection should be reconstructed to provide for smoother traffic flow through the crossing.

   Estimated cost of reconstruction: $25,000

3. The 35 mile per hour speed limit should be reduced to 30 miles per hour or lower just after the above-mentioned rail crossing on Washington Street WB, and appropriate signing should be provided as to the hazardous nature of the immediately upcoming Locust Street intersection with Washington Street. This signing should be provided in both directions on Washington Street.

4. Washington Street's intersection with Woodland and High streets should be reconstructed to provide for a realigned juncture of Woodland and High streets (which meet at a skew at present), an exclusive right turn lane on the Woodland Street approach and ideally an exclusive left turn lane on the Washington Street WB approach. Signalization of this reconstructed and realigned intersection is recommended and meets the warrants for minimum vehicle volume. Signalization should include fully actuated signals with a left turn phase for Washington Street WB traffic turning onto Woodland Street, and allowing for right turn on red (RTOR) on both the Woodland and High street approaches. Reconstruction of the intersection with the above exclusive turning lanes on Woodland and Washington Street WB should be undertaken whether or not signalization is included in the project, and would involve widening Woodland Street's approach to 30 feet from the existing 23 feet, and widening Washington Street's WB approach to 32 feet from the existing 28 feet. If signalization is implemented signal phasing must be coordinated with the existing signals at the Washington Street and Concord Street intersection just 1250 feet to the west of this intersection to provide for optimal vehicular flow and minimal queuing, particularly of vehicles on Washington Street in either direction.

Estimated cost of reconstruction and
signalization: $100,000 to $120,000

5. The existing traffic control signals at the Washington Street and Concord Street intersection should be replaced with more current and fully actuated signals according to standards of the Manual of Uniform Traffic Control Devices. Long term consideration should be given to the reconstruction and realignment of this intersection to provide for improved flow of through-vehicles on Washington Street and right-turning vehicles form Concord Street to Washington Street WB and from Washington Street WB to Concord Street NB. In the meantime, consideration should be given to augmenting the flow of through-vehicles on Washington Street EB via increased green phase timing or a green arrow, provided that either does not interfere with left turns from Concord Street to Washington Street EB. Serious consideration should be given to restricting access of vehicles, via curbing and increased roadway definition, from Washington Street's EB lane and the parking area in front of the assorted commercial establishments at the southern edge of this intersection. Of particular concern are vehicles which cross the intersection's approach lanes directly form the parking area in order to proceed west on Washington Street. Ideally, all parking at this commercial plaza should be relegated to the existing and spacious rear and side parking areas of this commercial plaza; but failing this measure, well-defined access and egress points, to the far east and west of the plaza, via curbing and signing should be provided, with perhaps speed humps at intervals along the length of the parking strip in front of the plaza to discourage high-speed vehicular use of the plaza's parking access lane to avoid the signal on Washington Street EB.

   Estimated cost of new signalization: $25,000 to $30,000

6. The one-way Curve Street access to the residences and parking area to the rear of the above commercial plaza at Washington and Concord streets should remain one-way in its present direction, but speed humps should be constructed along this narrow .14 mile long access street to discourage the high-speed use of Curve Street as a by-pass of the signal on Washington Street. Speed humps are not approved by MDPW as a traffic control device, but many communities, including the City of Boston, have installed them on local roads and find them to be successful in reducing vehicle speeds. Special care will have to be exercised in the placement and spacing of these humps for safety purposes during snow plowing of this street.

   Estimated cost of constructing speed humps: About $100. apiece.

7. The Washington Street at Hollis Street intersection is provided with good sight lines and illumination, and despite a history of angle collisions between right and left-turning vehicles from Hollis Street and vehicles in either direction on Washington Street, this intersection operates reasonably well. This intersection, which provides for both exclusive right and left turn lanes on the Hollis Street approach, should be monitored over the long term and should traffic volumes increase on Hollis Street or should accidents increase at this location then signalization or other traffic control measure such an overhead intermittent warning signal should be considered for this intersection.

   Note: Should the Washington Street and Central Street intersection be signalized, as is recommended below, signalization of the Hollis Street intersection would be inadvisable in that the two intersections are only 350 feet apart. Other traffic control measures would have to be pursued here in the event of increased volumes on Hollis Street or an increased incidence of vehicular accidents.

8. Signalization of the intersection of Washington Street and Central Street is warranted under the minimum vehicular volume and accident experience warrants. This intersection should be signalized with fully actuated signal system providing for a left turn phase from Washington Street WB to Central Street SB, and manually actuated pedestrian signals. Consideration should be given to the removal of some or all of the parking spaces on Central Street just south of the intersection to provide for a wider approach lane on Central Street. Consideration should also be given to dividing the 30 foot wide Central Street approach into three 10-foot wide lanes, with exclusive left and right turn lanes to provide for improved flow of vehicles on this approach; particularly for right-turning vehicles to Washington Street EB, for which RTOR should be allowed if signalization is implemented. Parking on the southern edge of Washington Street should be prohibited from at least twenty feet to the east and west of the intersection to provide for improved sight distances for vehicles on the Central Street approach. Further consideration should be given to removal of all parking spaces on the south side of Washington Street to the west of Central Street to provide for an exclusive right turn lane to Central Street form Washington Street EB within its existing alignment. As volumes increase on Washington Street in both directions and capacity of the Washington Street/Central Street intersection becomes more constrained, removal of all on-street parking spaces in the immediate vicinity of the intersection on Washington Street (about 14) should be seriously considered. In the meantime, improved lane definition on all approaches should be provided via restriping of all lane, crosswalk, and stop lines.

   Estimated cost of signalization: $75,000

9. Existing signals at the Washington Street and Highland Street intersection should be replaced and upgraded with fully actuated signals in conformance with the Manual of Uniform Traffic Control Devices. Consideration should be given to a reconstruction of the intersection to provide for an exclusive left turn lane on Washington Street in both directions (requiring widening from the existing 28 feet to 30 or 32 feet wide), and exclusive right turn lanes on Highland Street in both directions (requiring widening on Highland Street's approach to 30 feet from the existing 25 feet).

   Estimated cost of signal replacement: $25,000 to $30,000

10. The intersection of Washington Street and Summer Street should be signalized with fully actuated signals according to standards of the Manual of Uniform Traffic Control Devices. Signal warrants are met at this intersection for minimum vehicle volume, accident experience, and systems (the intersection of two major thoroughfares). Signalization should accompany reconstruction of the intersection to provide for an exclusive left turn lane on Washington Street WB (requiring widening of Washington Street from 28 feet to 32 feet on this approach) and improved definition, via curbing and signing, of an vehicular channelization around the existing traffic island on Summer Street (i.e. restricting vehicle flow on the western edge of the island to right-turning vehicles from Washington Street EB to Summer Street SB instead of the ill-defined two-way traffic allowed there at present). Overhead illumination and signing should be improved at this intersection, and long-term consideration should be given to reducing the slight elevation of the hill upon which Washington Street intersects Summer Street.

    Estimated cost of signalization and reconstruction: $75,000

C. Milford

1. The intersection of East Main Street at Beaver Street and Fortune Boulevard should be reconstructed to provide for wider approach lanes on Beaver Street (from 21 feet to 24 feet wide), which would provide for a better juncture with Fortune Boulevard, with which it now intersects at a slight skew. Signalization is not needed at present at this intersection, but the traffic volumes and accident volumes should be monitored so that signalization may be implemented is needed at a future date.

   Estimated cost of reconstruction: $25,000

2. The traffic control signals at the East Main and Medway streets intersection require increased routine maintenance to provide for repair of inoperative lamps and signal components, and the timing of these signals should be adjusted to provide for optimal phasing and timing (the signal is currently on a 40 second cycle instead of the recommended 60 or 90 second cycle).

3. All overhead illumination on East Main Street within the study area should be brought up to current lighting standards in terms of illumination quality and spacing. Many of the existing lights are of an outmoded variety featuring a bare bulb, and some lamps are inoperative.

D. Study Area-Wide

1. The Towns of Sherborn, Holliston, and Milford are encouraged to consider methods of implementing flexible work hour and shared ride programs among their own employees, among employees of major employers within their communities, and among their residents. Recent studies have shown that the aggressive pursuit of flexible work hour and shared ride program s within an area can yield a ten to fifteen percent reduction in peak hour traffic under ideal conditions. MAPC and other agencies of the Commonwealth including Caravan for Commuters, Inc. remain available to the study area communities for help in pursuing these methods of reducing vehicular volumes on Route 16 and other study area roadways.

2. The three involved communities in the study area should begin now to pursue strategies with which they may manage the growth which the study area is attracting, while minimizing the negative impacts associated with that growth, notably the traffic impacts.

E. Funding

The entire length of Route 16 within the study area is on the federal aid primary system and therefore all improvements to Route 16 which are persued are eligible for federal and state funding. Eligibility for federal and state funding and availability of that funding in the case of major transportation improvements are not necessarily coincidental. Funding for major improvement projects is scarce and most available federal and state funds for over the next few years are already committed to projects by the Commonwealth. The study area communities should also be aware that the use of federal funds in implementing improvement projects require higher construction standards and consequently much higher costs than would be incurred if the towns pursued improvements with their own funds. The cost estimates provided herein for recommended projects are those which could reasonably be expected to be associated with the use of state funding for these projects. The use of federal funding would raise these estimates and the use of local funds would lower these estimates.

Community pursuit of federal funding (primary or other) and state funding (Chapter 90) for any transportation improvement project is explained in depth in MAPC's Transportation Programs, A Guide for Local Officials in the Metropolitan Boston Region (1983-1984), and it is to this document that we direct town officials interested in this course of action.

Serious consideration should be given to pursuing low-cost improvements such as lane striping, increased signal maintenance, overhead illumination, improved signing, and other as recommended herein with local funding, employing local personnel where appropriate. Serious consideration should also be given to taking or otherwise reserving land at problem locations to insure its availability at that time when a substantial improvement project may be undertaken.

VI. APPENDICES

A. Accident Data Analysis
B. Traffic Counts
C. Bibliography

APPENDIX A

Route 16 Corridor High Accident Locations
Sherborn, 1978-1980

Location	# of Acc.	# Injury Acc.	# Property Acc.	Accident Type(s)	Comments
Washington Street (Rte 16) at South Main Street (Rte 27)	57	7	50	33 rear-end, 21 angle, and 3 head-on collisions	The majority of accidents involve two or more vehicles rear-ending at the South Main Street stop sign (50%); followed in frequency by angle accidents (37%); rear-end accidents among vehicles on Washington Street WB (7%); head-on collisions involving vehicle making left turn (5%); and rear-end collisions among vehicles on Washington Street EB (1%).
Main Street (Rte 16/27) at Eliot Street (Rte 16)	30	4	26	18 rear-end, 7 angle, 1 head-on, 2 ran-off-road, and 2 unspecified	The majority of accidents involve two or more vehicles rear-ending at any of the three lights (60%); followed by angle accidents (23%); vehicles leaving the road or hitting fixed object (6%); and head-on collisions (3%).
Washington Street (Rte 16) at Maple and Sanger streets	20	8	12	13 angle, 2 rear-end, 3 ran-off-road, and 2 unspecified	The majority of accidents involve collisions between vehicles entering and exiting Maple and Sanger streets and traffic on Washington Street (65%).
Main Street (Rte 16/27) at various Center curb cuts	14	1	13	7 angle, 4 rear-end, 1 ran-off-road, and 2 unspecified	The majority of accidents are angle (50%) or rear-end (28%) in nature, involving vehicles making left turns into any of the curb cuts in Sherborn Center.

Main Street (Rte 16/27) at railroad tracks	13	2	11	9 rear-end, 2 angle, 1 ran-off-road, and 1 unspecified	The majority of accidents involve two or more vehicles rear-ending at railroad tracks (70%) due to slowing or stopped vehicle; or angle accidents involving vehicle turning into service station (15%).
Washington Street at Western Avenue	8	3	5	4 angle, 2 rear-end, 1 head-on, and 1 ran-off-road	
Washington Street at Woodland Street	4	-	4	2 angle, 1 head-on, and 1 ran-off-road	
Washington Street at Page Farm Road	2	1	1	1 angle, and 1 unspecified	
Washington Street at Old Orchard Street	2	1	1	1 angle, and 1 rear-end	
Washington Street at Russet Hill Road	2	-	2	1 rear-end, and 1 ran-off-road	
Washington Street at Sawin Street	1	-	1	unspecified	
Washington Street at Greenwood Street	1	-	1	1 ran-off-road	

Route 16 Corridor High Accident Locations
Holliston, 1978-80

Location	# of Acc.	# Injury Acc.	# Property Acc.	Accident Type(s)	Comments
Washington Street (Rte 16) at Highland Street	38	10	28	20 angle, 9 rear-end, 6 ran-off-road, 2 head-on, 1 unspecified	The bulk of accidents (53%) involve angle collisions between left-turning and through traffic at this signalized intersection.
Washington Street at High and Woodland Streets	32	6	26	17 angle, 6 rear-end, 4 ran-off-road, 2 head-on, 2 unspecified	The bulk of accidents (53%) involve angle collisions between left or right-turning traffic to and from High and Woodland streets and through traffic on Washington Street.
Washington Street and Central Street	31	4	27	18 angle, 9 rear-end, 2 hit fixed object, 2 unspecified	The bulk of accidents (58%) involve angle collisions between left or right-turning traffic and through traffic on Washington Street. 29% of all accidents at this insignalized intersection involve rear-end collisions.
Washington Street at Brook Street	28	8	20	13 angle, 7 ran-off-road, 5 rear-end, 3 head-on	Angle accidents (46% of total) most often involved collisions between westbound Washington Street traffic and left-turning Washington Street traffic onto Brook Street at this 'Y' intersection. 25% of all accidents involve vehicles failing to negotiate the left turn from Washington Street to Brook Street, resulting in leaving road and hitting fixed object.

Washington Street at Summer Street (Rte 126)	25	8	17	14 angle, 6 ran-off-road, 4 rear-end, 1 head-on	56% of all accidents are angle collisions, particularly between left-turning traffic from Summer Street to Washington Street and left-turning traffic from Washington Street westbound to Summer Street. 24% of all accidents involve vehicles failing to negotiate the intersection and leaving the road.
Washington Street at Concord Street (Rte 126)	24	2	22	10 rear-end, 9 angle, 5 ran-off-road	41% of the accidents at this signalized intersection involve rear-end collisions at the lights, and 38% of all accident's involve angle collisions between left turning and through traffic.
Washington Street at Underwood Street	20	5	15	7 ran-off-road, 5 head-on, 4 angle, and 4 head-on	35% of all accidents involve vehicles leaving the road and colliding with fixed objects under wet or icy road conditions. The bulk of angle accidents and head-on collisions at this location also involve wet or icy road conditions.
Washington Street at Hollis Street	18	-	18	12 angle, 2 rear-end, 1 ran-off-road,	67% of all accidents at this unsignalized intersection involve angle collisions between left and right turning traffic to and from Hollis Street and through traffic on Washington Street.
Washington Street at Cross Street	12	9	3	4 rear-end, 3 head-on, 3 angle, 1 ran-off-road, 1 unspecified	

Washington Street at Curve Street	8	2	6	3 rear-end, 2 angle, 2 hit fixed objects, and 1 head-on
Washington Street at Chestnut Street	8	2	6	3 rear-end, 2 angle, 2 ran-off-road, and 1 unspecified
Washington Street at Charles Street	7	1	6	7 angle
Washington Street at Exchange Street	7	1	6	4 rear-end, and 3 angle
Washington Street at Church Street	6	1	5	5 angle, and 1 rear-end
Washington Street at Elm Street	5	-	5	5 angle
Washington Street at Oak Street	5	1	4	3 ran-off-road, and 2 angle
Washington Street at Pleasant Street	5	2	3	3 rear-end, and 2 hit fixed object
Washington Street at Cumberland Farms	4	-	4	2 rear-end, and 2 angle
Washington Street at Locust Street	4	4	-	2 rear-end, 1 angle, and 1 head-on
Washington Street at Courtland Street	3	-	3	1 angle, 1 rear-end, 1 ran-off-road
Washington Street at Old Town Road	3	1	2	2 ran-off-road, and 1 head-on
Washington Street at Cranberry Lane	3	-	3	2 angle, and 1 rear-end

Route 16 Corridor High Accident Locations
Milford, 1978-80

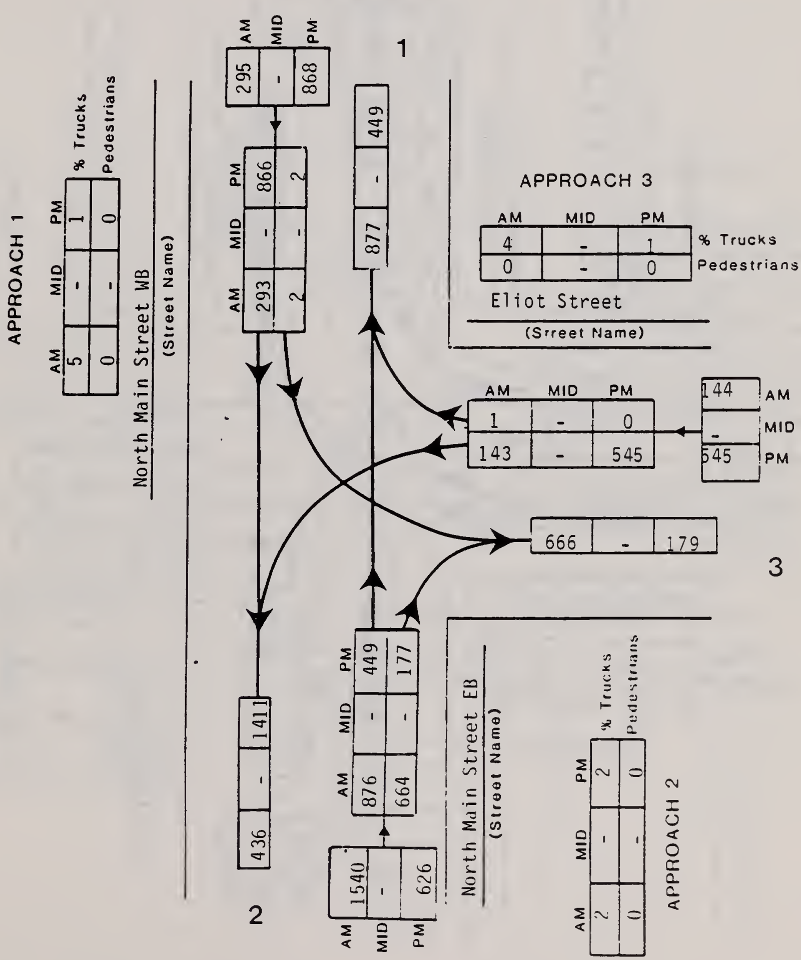
Location	# of Acc.	# Injury Acc.	# Property Acc.	Accident Type(s)	Comments
East Main Street (Rte 16) at Medway Street (Rte 109)	14	-	14	8 rear-end, 3 angle, 1 head-on, 2 ran-off-road	
East Main Street (Rte 16) at Beaver Street	10	2	8	5 angle, 4 rear-end, 1 head-on	
East Main Street (Rte 16) at Adams Street	7	1	6	3 ran-off-road, 2 rear-end, and 1 angle	The majority of accidents involve vehicles leaving the road or hitting a fixed object.

APPENDIX B

SUMMARY OF VEHICLE MOVEMENTS

Intersection North Main Street at Eliot Street

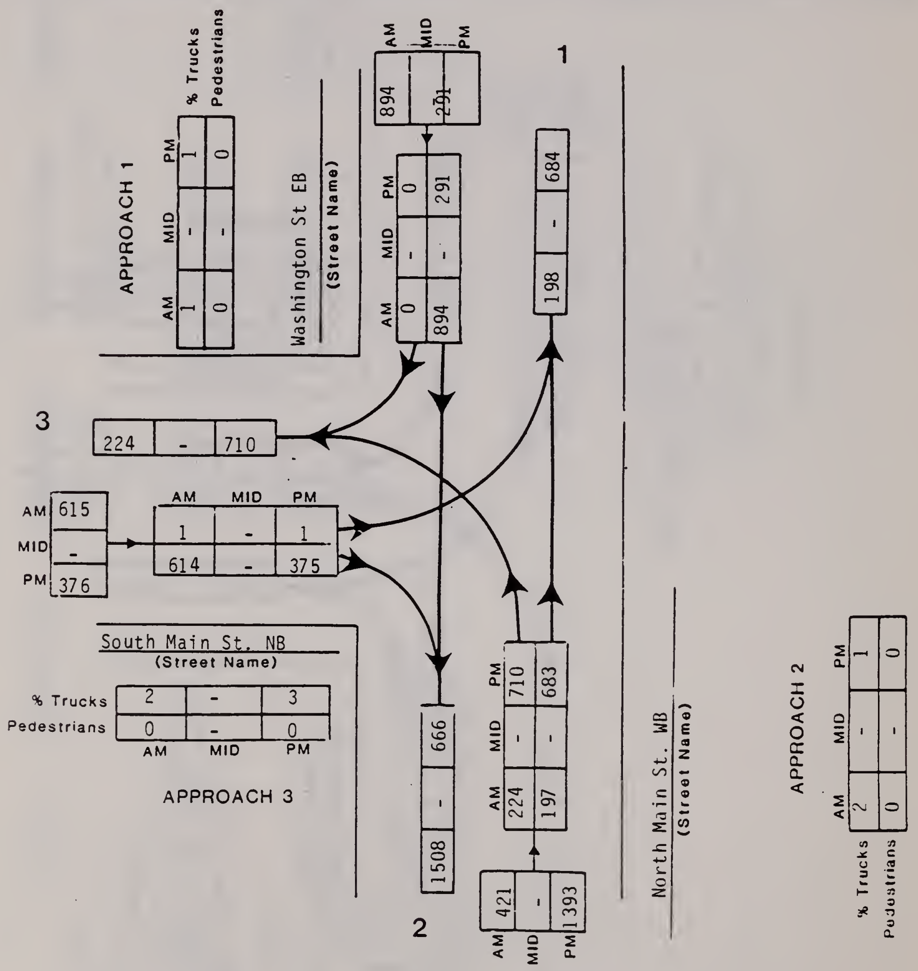
Date 9/4/84 Day of Week Tues Weather Clear/Dry Community Sherborn



SUMMARY OF VEHICLE MOVEMENTS

Intersection North Main Street at South Main & Washington Streets

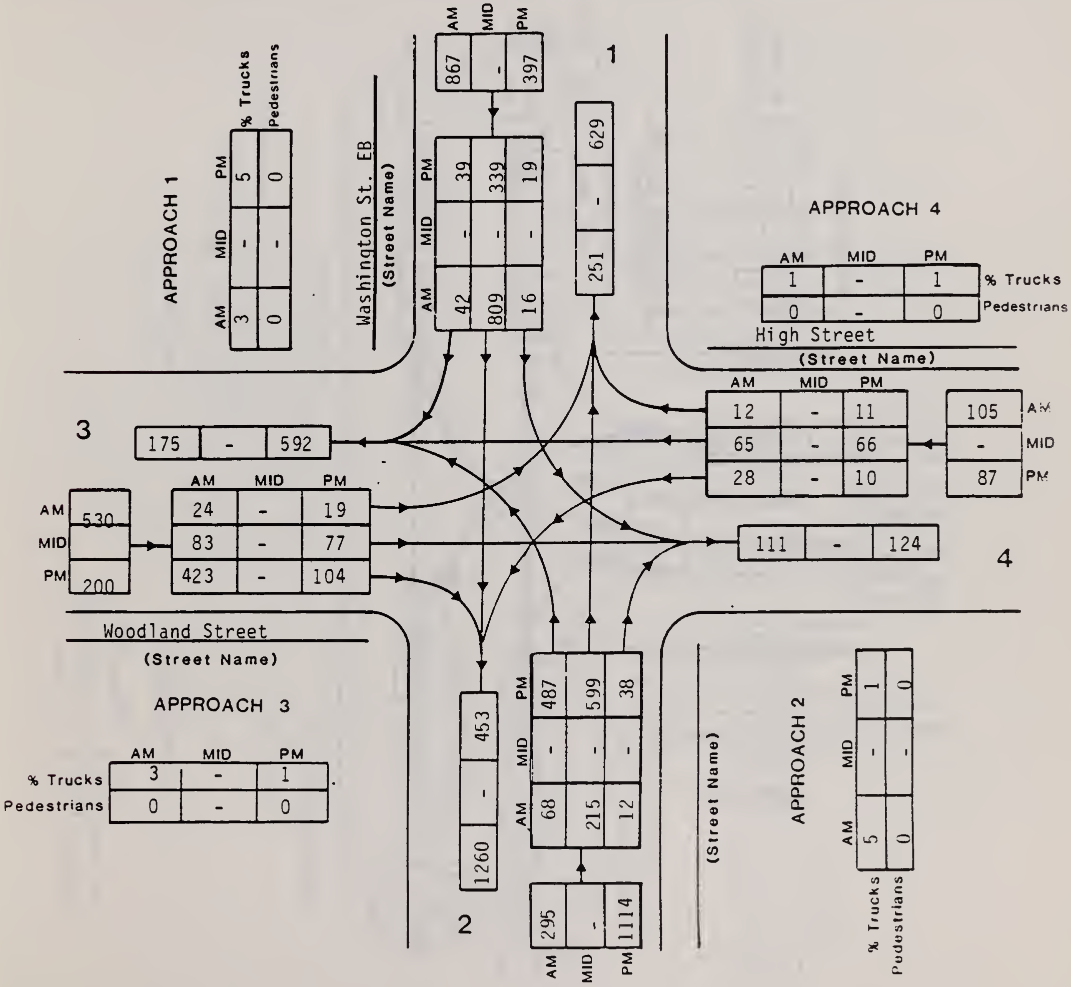
Date 9/12/84 Day of Week Wed Weather Clear/Dry Community Sherborn



SUMMARY OF VEHICLE MOVEMENTS

Intersection Washington at High and Woodland Streets

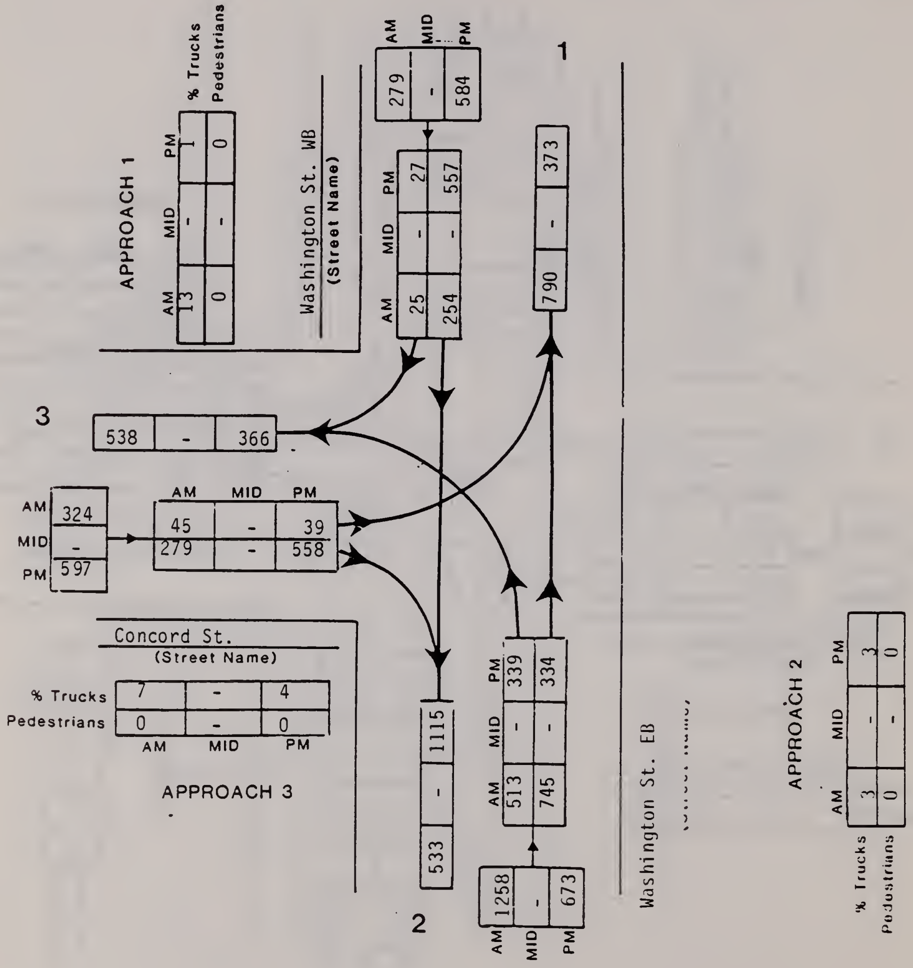
Date 10/18/84 Day of Week Thursday Weather Clear/Dry Community Holliston



SUMMARY OF VEHICLE MOVEMENTS

Intersection Washington Street at Concord Street

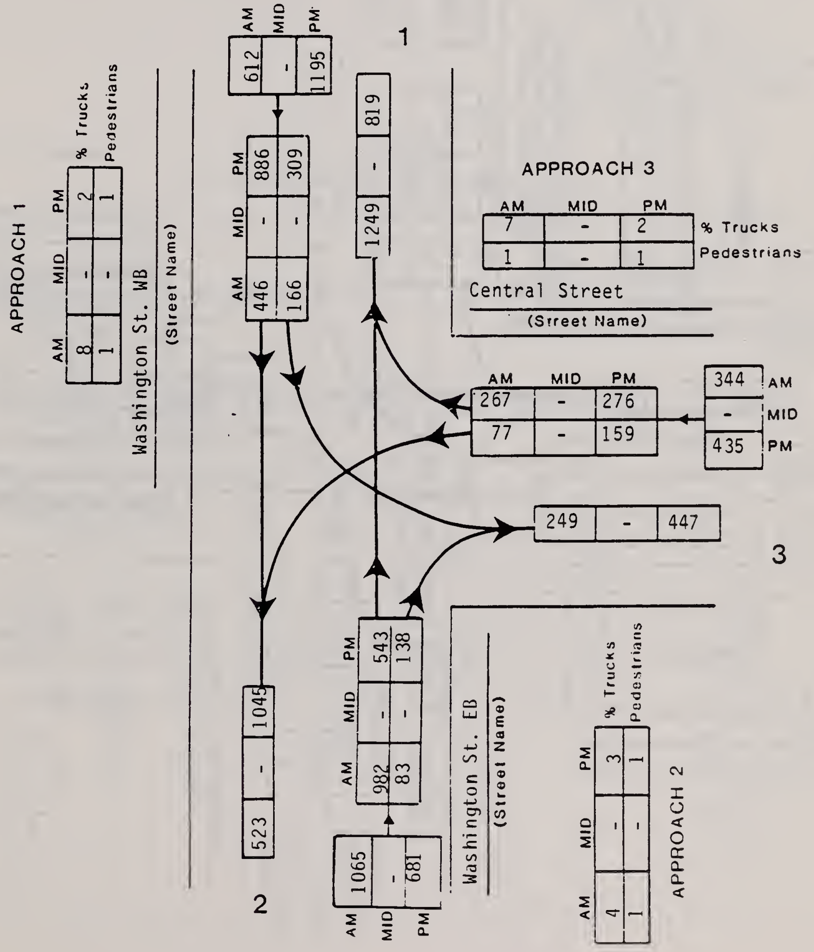
Date 10/11/84 Day of Week Wednesday Weather Clear/Dry Community Holliston



SUMMARY OF VEHICLE MOVEMENTS

Intersection Washington Street at Central Street

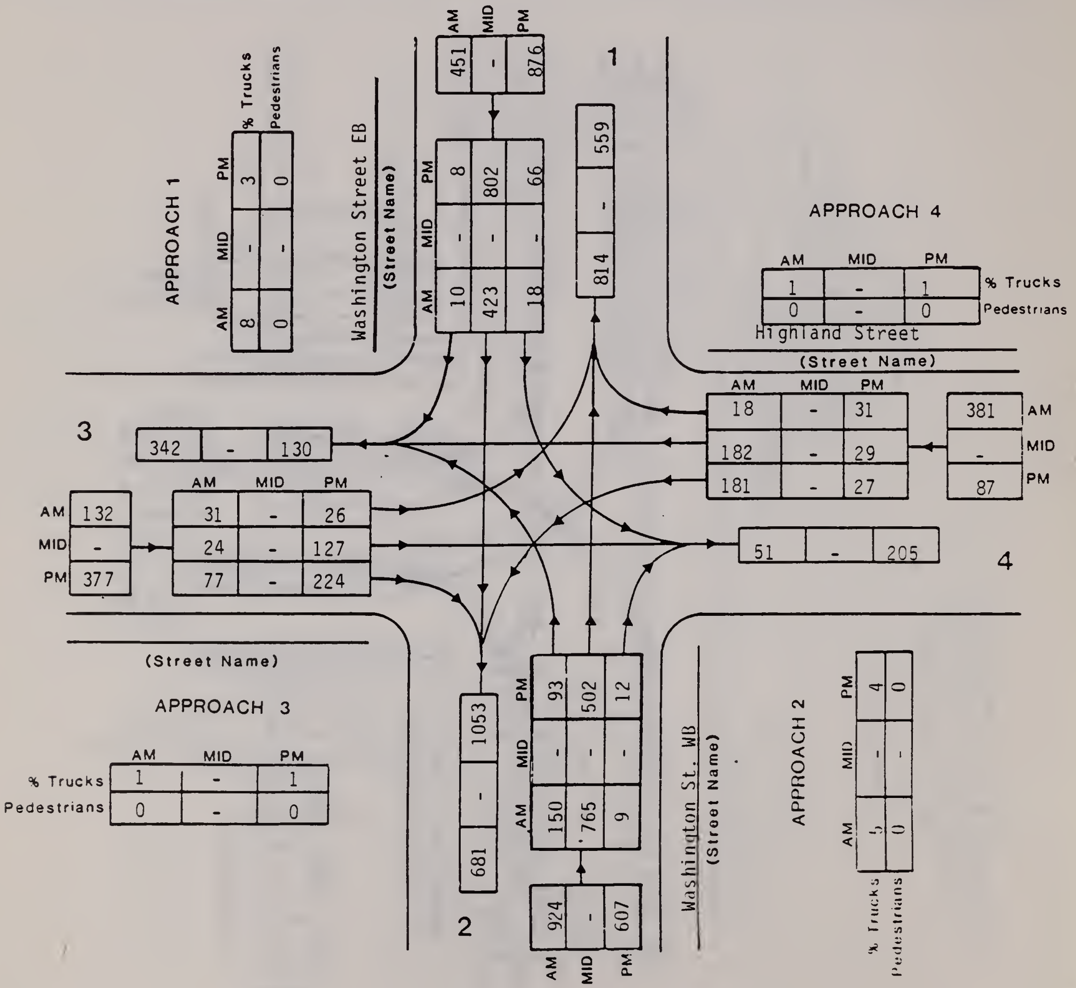
Date 10/16/84 Day of Week Tues Weather Clear/Dry Community Holliston



SUMMARY OF VEHICLE MOVEMENTS

Intersection Washington Street at Highland Street

Date 10/23/84 Day of Week Tues Weather Clear/Dry Community Holliston



APPROACH 1 — Washington Street EB (Street Name)

	AM	MID	PM
Approach total	451	-	876
Movements	10	-	8
	423	-	802
	18	-	66
% Trucks	8	-	3
Pedestrians	0	-	0
Leg 1 departing	814	-	559

APPROACH 2 — Washington St. WB (Street Name)

	AM	MID	PM
Approach total	924	-	607
Movements	150	-	93
	765	-	502
	9	-	12
% Trucks	5	-	4
Pedestrians	0	-	0
Leg 2 departing	681	-	1053

APPROACH 3 — (Street Name)

	AM	MID	PM
Approach total	132	-	377
Movements	31	-	26
	24	-	127
	77	-	224
% Trucks	1	-	1
Pedestrians	0	-	0
Leg 3 departing	342	-	130

APPROACH 4 — Highland Street (Street Name)

	AM	MID	PM
Approach total	381	-	87
Movements	18	-	31
	182	-	29
	181	-	27
% Trucks	1	-	1
Pedestrians	0	-	0
Leg 4 departing	51	-	205

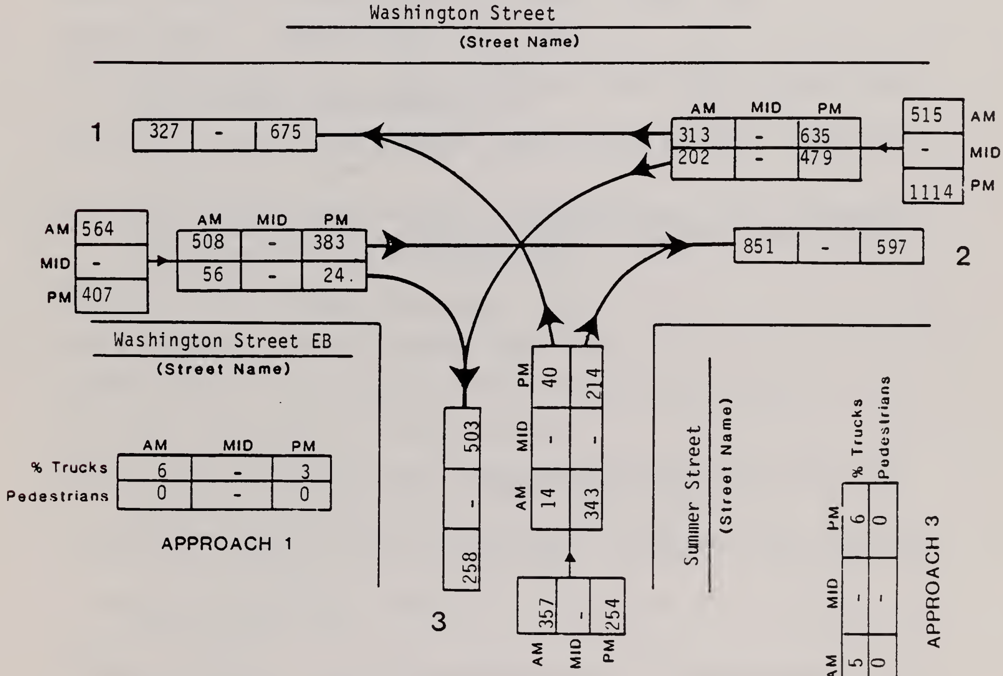
SUMMARY OF VEHICLE MOVEMENTS

Intersection Washington Street at Summer Street

Date 10/17/84 Day of Week Wed Weather Clear/Dry Community Holliston

APPROACH 2

	AM	MID	PM
%Trucks	8	-	4
Pedestrians	0	-	0



APPROACH 1

	AM	MID	PM
% Trucks	6	-	3
Pedestrians	0	-	0

APPROACH 3

	AM	MID	PM
% Trucks	5	-	6
Pedestrians	0	-	0